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# Europe Report

## SCIENCE AND TECHNOLOGY

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### SCIENCE AND TECHNOLOGY

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WEST EUROPE/AEROSPACE

AERITALIA ROLE IN NATIONAL SPACE PLAN SATELLITES DESCRIBED

Milan IL GIORNALE in Italian 12 Sep 86 p 12

[Excerpts] "Tethered" is the name given to a satellite which will be hanging by a thread in space within 2-3 years.

In fact, it is a 1.5 meter diameter bowl weighing one-half ton which will be kept on a kevlar leash 2 mm in diameter by the American space shuttle. The length of the thread will range from 100-120 km.

Once taut, this guiding thread intersects the lines of the earth's magnetic field and generates potential differences of several thousand volts precisely because of its length. This will be used to study the characteristics of the earth's magnetic field. It will also be possible, without interacting with the magnetic field, to generate power aboard the satellite which should be a significant source of power when working in space.

The "Tethered" satellite will also carry out another type of mission: It will be launched toward earth about 100 km below the American space shuttle, which will be attached to the other end of the thread. In this way, the Italian satellite will be immersed in the earth's upper atmosphere (at an altitude of 100-130 km), which still is a little known zone of the atmosphere. In fact, a satellite cannot remain for long periods in this atmospheric band because of the effects of atmospheric resistance and the earth's gravity.

Aeritalia is in charge of building this satellite while the American company, Martin Marietta, will supply the recovery system, that is the space winch that will allow the coiling and uncoiling of the thread to which the "Tethered" satellite will be attached like an electric bulb to its wire.

Aeritalia is involved in scientific programs of major importance, albeit associated with large foreign companies. This is true of "Hipparcos," a project in which Aeritalia is working together with the French Matra company, and which consists of building a satellite scheduled for launch within 2 years in a geostationary earth orbit (36 thousand kilometers).

The purpose of this project is to make a nearly complete catalog of space bodies, which does not yet exist. In fact, astronomers throughout the world are awaiting the project with great interest. Aeritalia will build the "cell" of the "Hipparcos" satellite, which will weigh a little more than a ton, and also will construct the "intelligent" internal parts on which the telescope

will be installed. Launching will probably take place in the first few months of 1988 with the Ariane rocket.

"Columbus is the European version of the 1990's space station concept," says Franco Bevilacqua, the manager of Aeritalia's future space programs, "and it is certainly the most important project in which we are involved."

Columbus, which is being developed in collaboration with the German company, MBB-ERNO, is a space station capable of different configurations through the use of sections which connect inhabitable modules of the Spacelab type.

These modules are cylinders 9.66 meters long and 4 meters in diameter. Up to four researchers can work inside them, using well designed units intended to house numerous experimental devices.

Elements of this type may also separate from the orbiting station and undertake missions, using their own means of propulsion.

"Sax", which is also part of the Italian Space Plan financed by the National Research Council, will survey all sources of X-rays scattered through space and will analyze their composition using spectroscopic methods. It will be launched by the Iris system between 1990 and 1991, and is scheduled to enter an equatorial orbit at an altitude of 600 kms. Its operating lifespan will be 6 years, during which it will transmit its observations continuously to the Malindi ground station in Kenya, where they will be redirected to an operating center in Italy.

Also within the framework of the National Space Plan is the planned launch of "Lageos 2" for laser studies of geodynamics and geodesy.

This satellite (which is a replica of NASA's "Lageos 1") weighs a little more than 400 kilograms. It will be launched into a low orbit (6 kms) by the American space shuttle, probably at the end of 1988 or at the beginning of 1989. The satellite is covered with mirrors designed to reflect laser rays sent from earth. By computing the rays' return time, it will be possible to make accurate measurements of coastlines, bradyseisms [bradisismi], telluric tremors, and so on. The Mediterranean region will be the object of this research.

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## WEST EUROPE/AEROSPACE

### MID-, LONG-TERM PROSPECTS FOR FRG AEROSPACE

Bonn WEHRTECHNIK in German Jan 86 pp 20-29

[Article by Wolfgang Flume: "Will All Expectations Be Fulfilled?: On the Situation in the German Aviation Industry"; first paragraph is WEHRTECHNIK introduction]

[Text] The German aerospace industry cannot at the moment complain about inadequate utilization of its development and production capacities, even though a certain gap will be left toward the end of this decade after the end of TORNADO production. For the mid- and long-term future, the industry is putting its hopes primarily on major programs such as AIRBUS, Fighter Aircraft 90 [JF-90] and the antitank helicopter. If these projects--currently in part somewhat controversial--can be realized, then the aviation industry really should have no major worries, especially since additional opportunities are opening up in the areas of missiles and drones. The following report makes some observations on the current situation in the German aerospace industry.

In terms of sales, the German aerospace industry, for which the abbreviation IRI is often used, is in fourth place in the world behind the United States, Great Britain, and France. With about 80,000 employees and sales exceeding DM15 billion, it is, to be sure, not extremely large in Germany in comparison with the automobile, electronics and chemical industries. Nevertheless, the German aerospace industry is characterized by a high level of performance and by still--or once again because of space operations--above-average rates of innovation. Possibly because of this and naturally through its high efficiency, it has also been at the top in German industry in recent years with respect to the increase in productivity per employee. The strong move of Daimler-Benz into three firms active in German aerospace shows that this branch of industry is also attractive for other enterprises and thus it may well be that the regrouping in the German aerospace industry is not yet at an end.

In speaking about the German aerospace industry here, we mean those firms that deal completely or at least partially with aeronautical engineering and that have generally come together in the BDLI (Federal Association of the German Aerospace and Equipment Industry). The very name of the association expresses the heterogeneous nature of the German aerospace industry. For one thing, special mention is made of the equipment industry to emphasize its importance

relative to the "superior" airframe firms and, for another thing, to express the fact that more and more German aerospace firms are involved in the "outfitting" of the other military services or that firms not primarily aeronautical are striving to move into aviation.

#### More Independent Through Diversification

After the concentrations in the 1970's, the aerospace industry is primarily Messerschmitt-Boelkow-Blohm [MBB] and Dornier as so-called air frame or, better, system firms and MTU Munich as an engine firm. About 70 percent of the employees and sales of the aerospace industry are in these three enterprises, whereby the sales figures are not, however, also a measure of value creation. As general contractors, and that is what these firms are in many cases, their share of the work is often only 15 percent and is thus sometimes far below that of many equipment firms participating in the same program. At the same time, it should be pointed out that the sales of MBB and Dornier also include activities foreign to aviation (but generally still military technology), whereby it is sometimes questionable whether or not an air force command system, for example, is still aeronautical engineering.

The two system firms, just as the other enterprises of the German aerospace industry, more and more quickly recognized the signs of the times and diversified, initially more in the aerospace area but increasingly also in what at first glance appears to be unrelated sectors. Medical technology is just one example. Environmental technology is another. This occasionally causes Dornier to have to emphasize that it "is continuing to be an aviation enterprise" or makes old MBB employees feel that they will soon be more a part of a commercial firm than of an aviation firm on account of some new participations by the company in areas foreign to aviation.

With the diversification, the firms want to free themselves from dependence upon the state as the sole contracting authority, which is quite all right with the state, for it is relieved of the "responsibility" for utilizing the capacities of the companies. On the other hand, however, the German aerospace enterprises also recognize that their know-how can also be used in other areas.

Nevertheless, the firms of the German aerospace industry also continue to rely on the contracts awarded by the armed forces, which account for an average of 50 percent of industry sales. Depending upon one's standpoint, this can be lamented or welcomed. The one that is active only in "civilian" areas is envious of what in its eyes is the almost guaranteed capacity utilization in military technology that can be planned several years in advance, whereas the one with a "military" orientation looks with envy to the exports of the commercially oriented firms and their high profits. Whatever the case, there is a kernel of truth for both. Because of the increasingly strong state-promoted competition, life is not easy in either market.

To be sure, the defense industry has the advantage of business that can be planned in the long term. But the number of large programs is also limited and more and more firms are competing for the smaller orders. And as desirable as major programs such as the JF-90--whose volume will hardly make

it a TORNADO program unless it can be exported very well--or the PAH-2 may be for system firms and outfitters, one should be warned against becoming so dependent upon the defender again. Will there not be enough problems for a large number of firms when TORNADO production comes to an end in the coming years? And bestsellers such as the MILAN, HOT or ROLAND sometimes encounter tough competition or in the meantime have contributed to a satiated market. The same thing has been true so far for the AIRBUS program: as successful as it may be and as correct as it is to develop new family members, this near monoculture in civilian aircraft construction is extremely dangerous. MBB in Hamburg has recognized this and is searching for a supplementary program.

Also easily recognizable is a change in the German aerospace industry: whereas previously aircraft programs were in the foreground, now there is more and more recognition in the civilian sector of the importance of space operations, not just as an area for high technology but also as a source of sales. To be sure, there are still a lot of public orders here as well--especially for research satellites or platforms--but the future holds more for applications satellites. And in military aviation, the role of the carrier or platform--that is, aircraft and helicopters--has diminished in favor of missiles, whether it be hypersonic guided missiles or standoff dispensers. In addition, more and more use is being made of remotely piloted vehicles for multiple missions. This often represents the first step toward the introduction of robots in the military. The firms have adapted themselves to these shifts more nor less rapidly or are preparing themselves for them with the effect that competition is getting even tougher and that there will soon be no more inheritances. It is, after all, important for one to secure the largest possible share of the almost DM3 billion for development and testing and DM17 billion for the procurement of missiles and drones that the Federal Defense Ministry wants to expend between 1986 and 1992.

#### New Competitors: Ammunitions Industry

In this connection, an industrial branch that was long considered "obsolete," namely the weapons and ammunition industry, could in the longer term become rather threatening for some enterprises of the German aerospace industry, both system firms and equipment firms. Its technological base has expanded considerably, in part with state support but also through great efforts of its own. The key idea in this connection is intelligent but generally terminally-guided or target-recognizing ammunition. Here too, the importance of the carrier (tube weapon or artillery rocket) has declined in favor of the part that is supposed to reach the target. What was previously seen as a simple steel casing with explosives is still explosives today, certainly, but is guided to the target by aerodynamics, electronics, optics, etc. Here the German aerospace industry has new competition, in part self-generated through cooperation, that will soon be giving it tough competition in its own original area of guided missiles, for the applied technologies do not, after all, differ very much. In addition, the rates of increase for intelligent ammunition are about 30 percent greater than they are for guided weapons. And when most of the missiles first come from Rue IV "Military Hardware" to Rue VII "Ammunition," that may sound like a reasonable concentration of forces but the "court suppliers" of Rue VII are the ammunition firms, so that the ammunition industry has even greater chances of being able to move rapidly

into the guided-missile sector. It is precisely some firms of the equipment industry that are sometimes pessimistic here. Still forced to cooperate by the government, they may soon be outflanked by the ammunition firms. And so they are already saying: "We do not want to operate a training program for the ammunition industry!" But this industry sees the whole thing almost as late revenge: "Did not the aerospace industry take a lot away from us 20 years ago when the role of tube weapons declined considerably with the introduction of guided weapons?"

#### Old Dispute Between System Firms and Outfitters

Today a "linking" element between the ammunition industry, the system firms and the outfitters is electronics but this is likewise resulting in a dispute that may never be settled: what is the task of a system firm and what is that of an equipment enterprise? Both are fighting for the larger and larger electronics share in flying weapon systems, both with arguments such as: technical knowledge in detail here, system know-how there--but where is the boundary? Whoever wants to exercise a system command function must have developed at least one important component, says the system firm; the optimum efficiency of a system is really made possible only through our special know-how, says the outfitter. But despite all the competition, the competitors are cooperating in more and more practical teamwork and are establishing joint subsidiaries. Live and let live...often also a result of the fact that qualified electronics personnel are extremely scarce.

But the competition has also increased between the two large system firms MBB and Dornier. The pretensions of MBB, now documented at the IIA '86 as well, of being the German "leading" firm in aviation and space operations is easily derived, certainly, from the number of employees, sales volume, and also the latitude of the technological fields being worked, but Dornier is now no longer the "small" enterprise relying on itself for financing. The affiliation with the Daimler-Benz concern will presumably also lead to more willingness to take risks on the part of the enterprise, which has heretofore been very cautious in this connection, thus promoting its movement into new and larger projects or the fight for a greater share in joint projects such as the JF-90, for example. Its withdrawal from the Deutsche Airbus GmbH several years ago because of what was then--rightfully--an excessive risk would probably not have happened as a Daimler-Benz subsidiary. It remains to be seen whether the company, as a "sister" of MTU and AEG, can again extend its technological base beyond the breadth that it has already achieved. In any case, regardless of how independent the firm can be, Dornier is part of a large, indeed very large grouping. And that counts in Munich as well as abroad.

Although externally things have calmed down somewhat, a continuing cause for speculation is the discussion of the regrouping of MBB shareholders triggered several months ago by the rumors of a BMW participation. But has MBB not lived well so far--would a majority shareholder really be advantageous?

## Hopes for New Major Programs

At the present time, the German aerospace industry still depends a great deal, indeed too much, upon such large-scale projects as the AIRBUS or the TORNADO as the largest current production projects.

Let us stay with aircraft production for the time being. It can be assumed that the AIRBUS family will continue to provide jobs in the development and production area. In addition, MBB is involved in the Fokker-100 and projects are being prepared with China and Indonesia with the goal of not being exclusively dependent on AIRBUS. Dornier has a few percent ownership in AIRBUS, mainly to utilize its production capacities in Munich. Is it possible that there the current Dornier chairman of the board and former general manager of Airbus Industries, diplomate engineer Johann Schaeffler, is preparing a greater commitment in AIRBUS? He himself should be able to judge best whether such a measure makes sense or not. In any case, if Dornier is to continue to be considered an aviation firm in the civilian area as well, a decision must be made whether the DORNIER 228 is to become a pressure-ventilated small commercial aircraft DORNIER 328. Whether they can still do that by themselves? Even as a member of the Daimler-Benz group, it would be appropriate for Dornier to look for a partner. Dassault or Aeritalia? Or even a non-European firm?

At this point, to be complete, a few words about a special feature of the German aerospace industry, where it is even number one worldwide: glider construction. It is still holding on to the top position that it gained through the early application of glass-fiber reinforced plastic. It is gratifying that Porsche has also developed an aircraft engine and that some firms are taking unconventional paths with novel aircraft designs that will, it is hoped, be financially successful.

The space industry--MBB ERNO, Dornier and some enterprises of the equipment industry such as AEG, for example--probably need not be concerned about the utilization of capacity. The Federal Ministry for Research and Technology is making provisions in this connection through its support for the programs ARIANE 5, the COLUMBUS space station, and presumably the HERMES space transporter as well. To be sure, the question occasionally arises whether one is always involved in the right projects. Is it not possible that the development of the HOTOL [horizontal takeoff and landing] space transporter proposed by the British would be technologically more interesting and challenging than a participation in the French HERMES patterned after the American SPACE SHUTTLE prototype?

In military aircraft construction, the TORNADO production now to be extended through a seventh batch is for many enterprises the decisive factor in the utilization of their production capacities. Programs for upgrading combat effectiveness as in the F-4 and ALPHA JET provide jobs for only a few firms, so that a hiatus will be opening up until the start of the JF-90 production in the mid-1990's.

In the development sector, they are concentrating everything on the hoped-for participation in the JF-90, PAH-2 and NH-90, especially in the equipment industry. A failure of one or the other program would be catastrophic. Licensing programs would certainly utilize production capacities but not development. And this would also greatly limit the technical efficiency and competitiveness of the German aerospace industry relative to foreign enterprises. It is more than questionable whether MBB or some enterprises of the equipment industry would again be able to develop combat aircraft or civilian helicopters, even as European cooperative projects, without the JF-90 and PAH-2.

The situation appears very optimistic in the missiles area. Despite some momentary worries about capacity utilization in the production area, there are development programs such as ASRAAM, PARS 3 or ANS that will be providing jobs beginning in the mid-1990's. In the short term, there will be some reproduction programs that will help to fill the production gaps, at least in part, between the second and third generations of missiles. In the long term, because of the importance of missiles, especially the standoff weapons such as SR and LRSOM, the prospects of industry are even very good. The ammunition industry will have something to say here, however. And the subject of air defense could offer very special opportunities if one truly develops a system here that is aimed at the threat.

Neither should one forget the activities now under way for drones and remotely piloted vehicles. Here, to be sure, the system firms do intend to play a leading role but the outfitters will also compete more intensively, for the aircraft itself plays only a very modest role in the overall system that includes aircraft, sensor analysis, remote control, evaluation, etc.

If such programs as the JF-90 and PAH-2 are carried out, then the engine industry--practically MTU for the larger engines and KHD for smaller engines (with the endeavor to be involved in larger engines such as that of the JF-90, for example)--should not have any worries either, especially since both firms, particularly the MTU, are striving to strengthen their civilian leg. In the case of MTU, the firm's policy of being involved in the development and production of as many up-to-date civilian engines as possible is already starting to pay off.

And neither should the equipment industry have any real reason to complain, provided, of course, that the JF-90 and PAH-2 come. More through the vigorous action of the ministries of economics and defense than through the "awakening" of part of the industrial branch, it was possible to ensure that the German equipment industry has a greater and greater share of major programs. In the case of AIRBUS, for example, the share of German equipment increased from 15 percent in the A-300 and 16 percent in the A-310 to over 30 percent in the A-320. The resulting improved capacity utilization in the equipment firms should provide for increased developments of their own, with the result that the outfitters become even more competitive internationally.

## Cooperation in New Markets As Well

Internationality or cooperation in the German aerospace industry is indeed a very crucial factor. Without cooperation, practically nothing at all works. After all, by far most German defense projects, above all the large ones, are carried out internationally. Examples of good cooperation, despite minor shortcomings, are TORNADO, ALPHA JET and the German-French missile projects. Will it be possible to repeat this in future projects? It is doubtful in some cases. Let us take the missile programs MILAN, HOT and ROLAND. There were coordinated requirements (even though controversial at first) and only two equal partners participating. What, on the other hand, is the situation today with the follow-on system PARS-3?

Three large partners--France, Germany and Great Britain--and five small partners all want to participate qualitatively in development in accordance with their needs and naturally in technologically high-quality parts, with the result that the program is delayed more and more, the administrative expenditures for government and industry rise, everything becomes more expensive, etc. Is it not possible that here the political price of the participation of the smaller partners is sometimes too high? Too many cooks spoil the broth and that means as few partners as possible, at least in the conception and definition, if not in the development as well.

Precisely for German industry, a very crucial advantage of the defense cooperation is that it is thereby given the chance to participate almost as a supplier for the export business of its foreign partners. The best examples are the missiles and TORNADO. Here a sort of compensation has been found for the limitations of the otherwise still restrictive German arms export policy.

A new type of international cooperation has appeared in recent years. Whereas heretofore the partners came almost exclusively from European NATO countries, especially with France as the still preferred partner, the German firms seem to be more and more aware of the "world." Indeed, less the United States than the so-called threshold countries. Dornier developed the jet trainer IA-63 PAMPA for Argentina. MBB is now developing a light LCA combat aircraft and the AIH helicopter for and with India. A 75-seat MPC-75 commercial aircraft is to be developed with China and a small BN-109 helicopter with Indonesia--the examples can be continued. Is that all just development aid? In part, yes, but at the same time it is guaranteeing a share in future markets that would otherwise be closed by protectionism.

#### The Wish: Occasional System Leadership

In these projects, it is possible to put into effect (or it comes about automatically) what the German industry misses in cooperation: a true German system leadership. In their eyes, this lowers their value as partners in international programs. Industry, however, must then be prepared to take some risks. In the case of the PAH-2, for example, Germany wanted to play the role of pilot. At the wish of industry, however, the responsibility was then shifted from MBB to the joint MBB-Aerospatiale subsidiary Eurocopter.

In the handling of joint projects, one partner must not necessarily be number one. It seems to me that it is much more important for more ideas to be generated in Germany with respect to future systems and for these ideas to be discussed with the ministries, so that they can then be presented to the partners as a German proposal or so that the partners can be invited to collaborate. Why must we always jump on one train and why not occasionally play the role of locomotive? Why not, for example, strive for conceptual leadership in an anti-aircraft defense for the years after the year 2000 and should it now be called Tactical Air Defense System or EVI?

#### Capacity Utilization Through Reproduction Programs

Less in the foreground of interest, because they are more pure production than development projects, are the reproduction and compensation programs. If a foreign customer demands compensation, our industry grumbles that this results in a loss of jobs. Without cooperation, however, the customer would not have ordered at all. The same industry, to be sure, is very glad when the agency with parliamentary support demands compensation in Germany for weapons purchases in the United States or even has the systems built here completely under license. In part, such programs as the STINGER, HARM, ARMRAAM or PATRIOT make a significant contribution to the capacity utilization of production. Is it not possible, though, to strive, in an early decision on reproduction, to have the European production for the Americans be considered as a so-called second-source production, with increased chances of competing



with the American offerer even for orders by the American armed forces? This was once presented as possible for the RAM but for a long time no more was heard about it.

#### Improvement of Efficiency

The difficulties with the major projects JF-90 and PAH-2 naturally immediately led to the question: who is responsible for this? Here no guilty party is sought but the discussion of the program delay and related cost increases has somewhat marred the relationship between the government and industry. The industry has probably seldom had its knuckles rapped as much as in recent months--WEHRTECHNIK itself noted this in its investigations of the industry: even board members normally very willing to provide information were intimidated and avoided saying anything that could have offered even the slightest reason for criticism by those "in Bonn." Whereas Undersecretary of Defense Prof Dr Manfred Timmermann in his interview in the May issue of WEHRTECHNIK indicated prospects for an improvement in the efficiency of official defense management, industry also wants to make its contribution to a better program management. Especially the firms now on the firing line are more than eager to show themselves as reliable partners and to convince the Hardthoehe through their own performance that they can meet deadlines and costs. Leading firms also admit that the difficulty of a development program was underestimated or that they themselves were almost perplexed by problems that were not recognized in the tendering of the bid, with the comment by the editor's office at this point that the government also failed to recognize these difficulties in examining the proposals. Here some things could probably be improved if in the early phases of the development process for military hardware somewhat more money and perhaps time as well would be spent so as to be secure against surprises in development later. Then it would also be easier for industry to accept a fixed price for the development or at least large parts of it, perhaps sweetened with the bonbon of also being permitted to produce the first batch. Here, to be sure, honesty is required in the industry. Not that a firm names a low fixed price just to eliminate the competitors and to be awarded the contract and then adds requirements during the development, knowing that it is too late for another enterprise to take its place.

#### Why No Demonstrator Program?

The industry recognizes that the government (federal ministries for research and technology, economics and defense) is doing a lot in international concert to promote the competitiveness of the German aerospace industry. At times, however, continuity is missed. This is especially true for the preliminary technical work on the JF-90. Here there was a short-term flow of support followed by a long "break in transmission." And so the industry has strong hopes on a positive effect of the long-term research and technology concept of the Federal Ministry of Defense.

What is lamented above all is the lack of a demonstrator program such as RAFALE in France or EAP in Great Britain, not only from the "air frame" industry but also from some outfitters. Such programs--and, on the engine side, one could also name the French DEXTRE and the British XG40--give the

industry in question a competitive advantage over its German competition with respect to the European fighter aircraft. The situation was just the opposite at the beginning of the TORNADO development. At that time, the German industry could have had recourse to technologies and components that were developed for several vertical-takeoff test supporters.

It should be noted, however, that the industry has very often helped out with its own developments, sometimes when money was quite scarce because lucrative production orders were lacking. At the same time, some firms are now striving to improve their competitiveness through the cost structure as well.

#### Industry Wishes

Naturally the aerospace industry also has requests to the official authorities that go beyond purely monetary matters:

--It laments, for example, the generally inadequate provision of the project management in the public area with personnel as well as with up-to-date working tools.

--It is astounded by the fragmentary concepts with which the military service branches sometimes enter into the development of an often quite costly system--often there is not even a concept going beyond the military service branch.

--There are often too many voices speaking at the Hardhoehe and it cannot be discerned which view might be valid in particular cases. Internationally, they already use the Italian word "Germanologia": it is a matter of finding out who in Germany has something to say--the political leadership, the military, the armament sector or even the parliament.

--Are not the German military demands occasionally too high? Can one not also fall back on equipment that has already been developed and thereby save money for other developments?

--Long development times that also become expensive should be prevented through less official bureaucracy. The phase decisions, to the extent that they cannot be combined, should be made more quickly.

For some of these ideas, however, the industry concedes that it is not always innocent when programs are delayed or when it gives in to the many voices from Bonn and then has its own engineers put some additional item or other into the program.

The editor's office of WEHRTECHNIK even had the impression at times that the government and industry have substantial difficulties in understanding each other. It is true that they talk about the same program but apparently in different languages. Were tactical requirements really not read properly by the industry or were they too misleading? Were questions by the industry construed as declarations of intentions? Here both sides should get together with much more trust, should have frank discussions and delve into questions and point out ambiguities in time.

[Box, p 22]

### 80,000 Employees in the German Aerospace Industry

At the end of 1985, the enterprises of the German aerospace industry registered 79,081 employees and thereby achieved the highest level since its reestablishment in 1955. This corresponds to an increase of 11.2 percent (+7,958) over the number on 31 December 1984. This increase includes 2,364 employees accruing through a changed method of data collection. The "adjusted" increase in employment is 7.9 percent.

Divided into the individual industrial branches, the result is (1984 values in parentheses):

--Aerospace systems industry	47,115	60 percent	(66 percent)
--Engine industry	7,336	9 percent	(11 percent)
--Equipment industry	22,306	28 percent	(20 percent)
--Materials industry	2,324	3 percent	(3 percent)
Total	79,081	100 percent	(100 percent)

With about 6,000 employees, space operations have a share of about 6 percent of all workers. The number of trainees was 2,996.

About 45 percent of the workers were active in the area of military technology and about 55 percent were in civilian aerospace operations. Including space operations, about 20 percent of the technical employees and workers were active in research and development, 50 percent in production, and 30 percent in maintenance and servicing.

The sales figures for 1985 are not yet available. In 1984, total sales amounted to DM13.43 billion. The systems industry accounted for about 67 percent of this, the engine industry about 10 percent, the equipment industry about 21 percent, and the materials industry about 2 percent.

From exports, that with DM7.42 billion accounted to about 55 percent of total sales, about 79 percent were in the systems industry, about 9 percent in the engine industry, about 8 percent in the equipment industry, and about 4 percent in the space industry.

An extrapolation from the available sales figures permits the conclusion that the total 1985 sales in the aerospace industry will be around DM15 billion.

[Box, p 28]

### Key Word: Promotion

The promotion of aeronautical engineering by the federal ministries of research and technology, economics and defense is often falsely equated with subvention. Whereas the Defense Ministry usually pays in full for the development of military hardware because of the special requirements and the difficult marketability of military aircraft, with an increasing tendency to demand that the development firms also participate in the financing, the Federal Ministry for Research and Technology has a support rate of 50 percent,

that is, the ministry and industry split the development costs. In the case of the Ministry for Economics, the support rate is usually 60 percent, except for international projects such as AIRBUS, for example, where 90 percent of the basic development and 85 percent of the improvement development is advanced. Those, of course, are repayable development-cost grants, whereas the Federal Ministry for Research and Technology requires repayment only in the case of development support very near the market. In addition, the Federal Government provides guaranteed credits for the production financing and--with a declining tendency--sales financing support to compensate for the very good conditions through which the sales of American aircraft are supported by the American Export Import Bank.

On the part of the Ministry for Economics, especially Undersecretary Martin Gruener, the coordinator there for the German aerospace operations, future promotional policy is to follow new rules:

--Assistance can be considered only when the enterprises document their confidence in the efficiency of the various projects through a greater financial involvement of their own; public assistance can be considered only as a supplement.

--The promotion is to be concentrated on the support for the development of aircraft; specific help in production and sales, where it still exists, is to be reduced further. An extension of the AIRBUS promotion conditions to other projects is out of the question.

--As an initial ignition, the promotion should fundamentally be concentrated on the development of the basic version. The support of improvement developments should be limited to the extent possible.

--To increase the technology content, the promotion must be examined and adapted continuously.

--As a rule, the support rate is 60 percent. In the future, higher rates of support are possible only for joint European projects.

--The repayment of grants for development costs is still to be linked fundamentally to aircraft sales. As a return service for the acceptance of risks, the Federal Government should participate in the success of the projects even after the repayment of the grants.

--To the extent that the financial situation of the enterprise to be promoted permits, the promotion can also take place through interest-bearing loans in the federal budget with a firm repayment schedule; in case the project fails, the repayment could be suspended completely or in part.

9746

CSO: 3620/4

WEST EUROPE/CIVIL AVIATION

FRG FIRM DEVELOPS BMFT-FUNDED BALANCE SYSTEM FOR AIRBUS

Stuttgart FLUG REVUE in German No 6, Aug 86 p 95

[Article by Helga L. Hillebrand: "Weight Control for the A320"; first paragraph is FLUG REVUE introduction]

[Text] With the VDO Weight and Balance System automatic calculation of weight and center of gravity are to be possible in future aircraft.

Load manifests and computations of aircraft weight and centers of gravity today are mostly produced manually on the ground. Sudden changes in freight or unprofessional loading of the aircraft result in trim problems for pilots and in higher fuel consumption and, hence, in uneconomical flight. Therefore, future commercial aircraft will be equipped with an automatic weight and balance system.

VDO Aircraft Instruments of Frankfurt has developed such a weight and balance system for use in the Airbus A310 and A320. A preproduction model subsidized by the Federal Ministry for Research and Technology [BMFT] is currently being tested on a Lufthansa A310. It was developed in cooperation with the American company Weico, a Honeywell subsidiary. The design of the measuring system corresponds to Airbus specifications.

The system can be installed on short, medium and long range aircraft. The measured values are indicated in the checkout or ECAM display in the cockpit. On the ground, the system measures the total aircraft weight and computes the center of gravity through sensors in each axle of the undercarriage. Both values are indicated with an accuracy of plus or minus 1 percent. The weight and balance computer also provides the pilot with a continuous weight and balance reading during flight by processing known fuel consumption and remaining fuel quantities data.

Necessary data are measured on the ground by 20 sensors distributed over the main carriage and nose wheel. VDO takes the value of the induced current in two coils as a measuring unit. The shear forces created by the weight in the carriage supports and spars control the movement of a metal tongue between two coils, producing a change of induction. This differential signal travels to the two computers which process the data. The method has a decisive advantage: once the system is calibrated, expensive maintenance and adjustment is not necessary. Even if an impulse generator in the carriage or even one of the computers should break down, the accuracy of the overall system is maintained because of its redundancy. VDO says the unit has an installation weight of 12 kg.

WEST EUROPE/COMPUTERS

FINNISH NET TO ACCESS EUREKA CONTACTS, DATA BANKS, AID RESEARCH

Helsinki HELSINGIN SANOMAT in Finnish 25 Sep 86 p 17

[Article by Jukka-Pekka Lappalainen: "University Computers Beginning to Speak the Same Language"]

[Text] Located scattered about Finland, our universities will soon be able to communicate better with one another and with international data banks when the OSI data system, donated to the Ministry of Education in Helsinki on Wednesday by the Digital Equipment Corporation, goes into operation.

This gift will also provide support for the project to develop Europe's computer networks, which is subsidiary to Eureka, a project in which the Ministry of Education represents Finland. Europe's universities and research institutes will be the first to put into operation computer networks that conform to the new standards.

Computers usually communicate with one another by making use of each computer manufacturer's own data communication programs. The lack of common standards -- a common language -- has made communication between typical computers and the construction of large computer networks difficult.

Many manufacturers of typical computers are now engaged in developing data communication programs for their computers that conform to the International Standardization Union's (ISO) so-called OSI standards.

Worth 600,000 markkas, the system donated by Digital among other things contains a MicroVax II central unit and data communication and message transmission programs that conform to the OSI standards. A common computer and a common data transmission network were in operation for a while as a cooperative venture between the Education Ministry and SITRA [not further identified] in the early 1970's, but the universities later got their own computers, for which there was no suitable solution to the problem of communication among them.

The country's universities and colleges are currently linked through FUNET (Finnish University and Research Network), the core of which is the State Computer Center and in it the Education Ministry data-processing system. The Digital system will be connected with FUNET as a node computer.

Led by department head Matti Ihamuotila, the FUNET team will participate in the Eureka computer network project in addition to developing our own university network, among others.

There are currently about 50 university and college computers in FUNET. Over 500 scholars are already using FUNET's international computer hookups obtained at the end of last year.

The new donation will, according to Culture and Science Minister Gustav Bjorkstrand, provide significant support for the universities' national and international hookups and make it possible for Finland to participate in the Eureka project right from the start. Hookups with international data banks, among other things, are important for Finland's scattered university network.

"Finland cannot be among the foremost if its international hookups do not work. The decisions on the new institution of higher learning law demonstrate that they fully understand the importance of this matter in the Council of State," Bjorkstrand, who accepted the donation, said.

While from the standpoint of the universities the research funding situation does seem to be bright for the next few years -- universities' real income will probably grow at a rate of about 15 percent a year and may therefore double in 5 years time -- the support provided by industry is of continued importance.

"It serves the goal of seeing to it that science in Finland remains in the forefront of international development," Bjorkstrand asserted.

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CSO: 3698/28

WEST EUROPE/LASERS, SENSORS, AND OPTICS

FRENCH RESEARCH IN USE OF LASERS FOR OPTICAL DATA TRANSMISSION

Paris INDUSTRIES ET TECHNIQUES in French 10 May 86 pp 55-56

[Article by Ph.L.C.: "Integration at the Sending End, as well as at the Receiving End"]

[Text] The optical fiber demonstrated that it was possible to transmit an optical signal over long distances. It was natural to anticipate the development of film components or subsystems capable of generating, detecting, guiding, modulating, and switching the beam of light without ever departing from the optical system. "As soon as passive and active components can be integrated on the same monolithic substrate, we'll be talking about integrated optics," insists Alain Carencu, leader of a group doing research on this topic at the Bagneux facility of the National Telecommunications Research Center (CNET). The past 10 years have successfully demonstrated the feasibility of numerous discrete components. Just recently, CNET developed a directional waveguide coupler capable of switching and modulating light. Made from lithium niobate, it is now the subject of a manufacturing contract with CIT Alcatel and is at this moment being tested on site in Lannion. The Laboratory of Electronics and Applied Physics (LEP), for its part, has developed a phase modulator on a GaAs substrate. The Laboratory of Electronics and Information Processing Technology (LETI), LCR Thomson, the Laboratoire de Marcoussis, and the universities of Nice, Valenciennes, Grenoble, and Lille are also doing work in this area. ... While it has raised intense interest, monolithic integration also poses serious problems. "The ideal thing would be to build all functions into a single material. Unfortunately, substances that lend themselves well to transmission cannot be used as passive waveguides." Alain Carencu is much more sanguine about an initial demonstration of integrated optics in the form of what is known as integrated micro-optoelectronics. An example: a laser and its command and control circuit on a single chip. Such integration is already on the docket. "It involves transmission and reception alike, since sooner or later it will be necessary to lower prices and offer more reliability and reproducibility," observes Alain Brenac, director of fiber optics at CNET Bagneux. An initial example: the development of a laser and its control circuit on the same gallium arsenide (GaAs) substrate. The system operates at 0.85  $\mu$ m and was developed by CNET. A number of Japanese laboratories are also working on this topic. At this point, the problem remains one of technological compatibility. "To succeed in this area, it will be necessary



to master the development of lasers on semi-insulating substrates," explains Jean-Claude Bouley, director of transmission research at Bagneux. On the receiving end, videocommunications are moving toward the integration of photodiodes and their amplification circuits. "At  $0.85\mu\text{m}$ , where silicon prevails, this is not an easy task," notes Andre Scavennec (CNET Bagneux). At that wavelength, another material may well have its say: gallium arsenide. "From this compound we developed a heterojunction bipolar transistor whose transmitter, made of GaAlAs and not GaAs, is transparent to focused radiation. The result? We have, on the same substrate, a photodiode supplying a transistor." At the  $1.3$  and  $1.55\mu\text{m}$  levels, work on photo-receptors is also proceeding. Here it is InGaAs that has been chosen for integration. CNET has developed a transistor and photodiode on a semi-insulating InP substrate. "The combination of these two elements on one and the same monolith is on the way to being realized," explains Andre Scavennec. Other work may yield more immediate results. This is the case, for example, with techniques for the production of  $0.85\mu\text{m}$  GaAlAs/GaAs laser diodes, where the vapor phase using organo-metals is finding imitators. Thomson has already shifted its production to this process. Still on the transmission side, but at  $1.3/1.55\mu\text{m}$ , the distributed feedback laser is proving particularly promising. Jointly developed by researchers from Thomson CSF's central research laboratory and others from CNET, it has been tried out on the Lannion-Perros Guirec link: 40 km of monomode fiber. It allows for the coding of 1.7 billion bits of information per second, 10 times more than the modulation speeds of the links already in place. In a word, it makes it possible to handle 24,000 simultaneous telephone conversations or 48 television channels without having to regenerate or reamplify the signal. Jean-Claude Bouley explains the major principles: "Today, a laser functions over several lines of the spectrum. For high output links, the ideal would be operation using a single transmission line. This is what the distributed feedback laser allows. The geometry of the active band has been modified by adding, next to the GaInAsP film a periodic variation in the refraction index, forming a diffraction system for the light propagating within." In a word, the structure forces the laser cavity to resonate at a single wavelength dictated by the system's pitch. This generation of "new" lasers will open up interesting applications for the end of the decade in at least three different directions, according to Jean-Claude Bouley. "In addition to improving the transmission rate of links, we will also be able to increase their capacity by transporting several wavelengths in the same fiber." This component allows us to foresee the development of optical multiplexers and demultiplexers with spectral windows that are narrow enough to couple at least ten lasers transmitting at different wavelengths in a single fiber. "The distributed feedback laser should also lead to low amplitude heterodyne signal detection. The signal to be detected is made to pulsate using a local oscillator operating at a very similar frequency." Detection gains of a factor of 10 at least can be expected. The regeneration pitch for optical links at  $1.55\mu\text{m}$  would be extended to approximately 20 km. "The third direction, which is not the least of them, is that integration will be facilitated. We would move beyond the construction of mirrors by cleavage, an operation that has put a major brake on monolithic integration to date."

Another line of laser development lies in reducing the amount of power consumed. "At the outset, we are aiming to reduce the threshold current. To do this, we are dealing with a stack of very thin films (50 to 100 Å), for example," explains Alain Brenac. At 0.85  $\mu\text{m}$ , the GaAlAs/GaAs laser diodes show a threshold current that is 3 to 4 times lower: 5 mA at CNET, compared to the world record of 2.5 mA. The first experiments in producing a laser on a silicon substrate are also taking place. It seems that a number of laboratories have succeeded, but with a threshold current of 900 mA! The repercussions of such a technique are easily imagined, given the know-how in integrated silicon circuits that has been developed. In photoreception at 1.3 and 1.55  $\mu\text{m}$ , new solutions are appearing based on III-V and II-VI components. People are already talking about the PIN photodiode made of InGaAs/InP or HgCdTe. LEP, CNET, the Laboratoire de Marcoussis, Thomson, and SAT are very active. The latter is the only company to have developed industrial photodetectors out of HgCdTe. At these wavelengths, researchers are also aiming to move from single to avalanche photodiodes.

Research on fibers is not standing still. Fluorated glass, for example, is the talk of the colloquia. If this medium delivers, it might be possible to build a transatlantic link without a repeater! Theoretical attenuation is 0.01 dB/km. Currently we are far from that point (5 to 10 dB per 2.5  $\mu\text{m}$ ). However, components closely track the progress of fibers. For example, the CNET has developed sources made from InAsSbP over InAs (between 2 and 3  $\mu\text{m}$ ) in liquid phase epitaxia. The University of Montpellier, for its part, is working on GaAlSb/GaSb transmitters (between 2 and 4.5  $\mu\text{m}$ ). With regard to detection, HgCdTe has emerged as the main candidate. "This exploratory region depends entirely on the success of the fluorated glass fibers themselves," concludes Alain Brennac.

13221/12948

CSO: 3698/646

WEST EUROPE/LASERS, SENSORS, AND OPTICS

BRIEFS

LIGHT-BEAM MODULATION METHOD--Will it be possible to transmit 15 television channels in a single optical fiber? This important question in the development of cable television was studied by a team of researchers that has just developed an original method of modulating light beams through opto-acoustic interaction. The team from the opto-acoustical laboratory at the Universite de Valenciennes et du Hainaut-Cambresis performed an experiment that enabled them to verify the feasibility of the project using visible light. Three channels were transmitted under excellent conditions over a single optical fiber. The researchers believe they will be able to reach a figure of 15. This method also makes it possible to keep the electrical signal in its usual form, as is the case with transmissions using Hertzian waves. Upon reception the light signal is converted by a diode into an electrical signal identical to one provided by a conventional television antenna, making decoders unnecessary. The system was presented recently by Idolko Moussa in his defense of his doctoral theses. [Text] [Paris AFP SCIENCES in French 12 Jun 86 p 30] 13221/12948

CSO: 3698/646

WEST EUROPE/MICROELECTRONICS

UK COMPANY TO MARKET ASSOCIATIVE MEMORY CHIP

Amsterdam COMPUTABLE in Dutch 1 Aug 86 p 21

[Unattributed article: "Parallel Port Associative Memory"; first paragraph is source introduction]

[Text] Glasgow--Very, very gradually, some progress is being made in opening up the narrow pathway to semi-conductor memory. The dual port RAM is being mentioned more and more often as the first step toward obtaining truly free accessibility. Today's report comes from Scotland, where Strathclyde University has developed a parallel port memory that will be marketed by the start-up firm Deductive Systems.

Admittedly, the description of the memory in the form it has come to us from London's IDB [Inter-American Development Bank] is somewhat general, so we won't be bothered with details of bits and bytes for the moment. The name selected for the memory was Generic Associative Memory (GAM), so the first two words "generic associative" allow a whole range of meanings to be attached.

The layout of the memory chip is described as being a 64 x 64 matrix, in which 11 terminals have been left open for connection to subsequent matrices. The report also mentions that a large number of small matrices works more efficiently than a single large one. There is no schematic representation of the chip.

A 64 x 64 matrix has a total of 4,096 intersections. In the GAM, each of these intersections has a switch which can be used in read-in to memory. Thus it can be seen that each one of a series of 64 items can be described in the memory according to 64 criteria.

Connections to other matrices can then be considered either lengthwise (more items) or widthwise (more criteria). Once again, such details are missing in the report so they remain somewhat speculative. The report does mention that elementary logical operations can also be performed at the intersections.

For the time being, Deductive Systems has manufactured the GAM prototypes with Nmos technology and with a 6 micrometer feature size. This may now be called conventional.

Commercial distribution is not being considered until a 2 micrometer Cmos version is available. Such a version is expected this autumn.

The report announces not just the chip, but two complete cards also. They are designed for use in VME or multibus systems. The card includes control logic and the software for programming is available. Those persons not wishing to purchase associative silicon right away can use a computer simulation initially for practice. Both the hard and the soft versions are included in one system under the name Fact.

Comparable intelligent (or associative) components exists under such names as KEE [Knowledge Engineering Environment System] and ART [Automated Reasoning Tool]. According to Deductive Systems, however, these are more expensive than Fact, which costs between 50,000 and 150,000 guilders depending upon the type of machine used.

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CSO: 3698/644

WEST EUROPE/MICROELECTRONICS

KARLSRUHE NUCLEAR RESEARCH CENTER CREATES 'MICROTECHNOLOGY' PROGRAM

Bonn TECHNOLOGIE NACHRICHTEN in German No 431, 15 May 86 p 9

[Text] With the creation of a "microtechnology" program, a major new work emphasis, the Karlsruhe Nuclear Research Center (Kfk) wants to expand its already existing initial efforts in this area and to contribute to an innovative thrust in the promising areas of mechanics, sensors, metallurgy, and micro-manufacturing. Applicability of research work and rapid technology transfer are assured by early cooperation with trade and industry: continued development and marketing of a KfK micro-manufacturing process will be carried out in cooperation with Degussa AG of Frankfurt and Steag AG of Essen. A relevant agreement was signed by the partners on 23 April 1986 in Essen.

A multitude of applications already can be envisaged for microtechnology; however, they still require intensive development. In micromechanics there are nozzles, optical and acoustical components, special filters, and miniaturized tools. In the area of microsensors, the applications include miniaturized sensors for pressure, temperature, humidity, chemical analysis, and radiation. Finally, in micro-manufacturing, specific localized differentiation in material composition is possible in the micro sector, in addition to the already described production of structures with a high aspect ratio.

8617/12859  
CSO: 3698/M266

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

EC COMMISSION ISSUES 1986 TECHNOLOGY WORKING PROGRAM

Bonn TECHNOLOGIE NACHRICHTEN in German No 431, 15 May 86 pp 12-13

[Text] The Commission of the European Community consider the main emphases of the working program for 1986 to be the creation of a broad market, cooperation in technology and economic policy, economic coherence, and social issues. 1985 demonstrated that the full exploitation of the community marketplace by 1992 and the reinforcement of technological cooperation are the real foundations of the renewed upswing. The importance of a broad market for profitable innovation and the importance of innovation for the continuing competitiveness of European companies make it evident that these are the two inseparable components of tomorrow's Europe.

With regard to cooperation and technological development, the EC Commission plans the following for 1986:

- Proposal for a 1987-1991 framework program for research and technological development;
- Interim report on the progress, scientific value, and importance for the Community of the seven multiyear research programs ratified in March 1985 (controlled nuclear fusion, radiation protection, radioactive fallout, biotechnology, stimulation, BRITE [Basic Research in Industrial Technologies for Europe] and non-nuclear energy);
- Overall assessment of activities of the Joint Research Facility (GFS), its programs, and its mode of operation; new guidelines;
- Proposal for assessment of the GFS multiyear research program (1984-1987) with a view toward the realization of a new 4-year program.

Information Technologies and Telecommunications

- Proposal for a decision on the second phase of the ESPRIT [European Strategic Program for R&D in Information Technologies] program (ESPRIT II) and proposal for a decision on a detailed work program for this second phase;
- Announcement on the creation of a broadband network for commercial communication ("transnational broadband backbone network");

- Announcement on the progress made in the creation of a Europe-wide telecommunications system;
- Announcement on the introduction of a second generation cellular telephone system in the Community;
- Announcement on the introduction of high definition TV in Europe;
- Reports on the execution of the multiyear computer science program (program assessment and economic situation in the various sectors of information technology);
- Proposal for a decision on implementation of the main phase of the RACE program (R&D in Advanced Communications Technologies for Europe).

#### Biotechnology

- Proposal for the BICEPS program (European Cooperative and Strategy for Bioinformatics);
- Proposal for a multiyear R&D program for the application of biotechnology in agriculture and the food industry.

#### Other Sectors of Technology

- Proposal for a multiyear program in the area of medical research for the years 1987-1990;
- Proposal for the Delta program (promotion of the learning process in Europe through technological advances);
- Proposal for the DRIVE program (special safety systems for road traffic and intelligent vehicles in Europe);
- Proposal for a decision on a program for electronic transmission of commercially used data;
- Proposal for extension of the existing first plan (1985-1988) for stimulation of cooperation and exchange in the area of science and technology in Europe through new measures (grants for highly qualified scientists, optimized use of large-scale scientific facilities in Europe);
- Proposal for a new multiyear research program on the role of science and technology in progress (1987-1990);

#### Innovation and Industry

- Proposal for the coordination of the individual national plans in the area of automated or computer aided translation (Systran);



-Proposal for expansion of the EUROTRA program (R&D project for an advanced automatic translation system);

-Reinforcement of actions for the promotion of innovation and technology transfer, especially with regard to infrastructure and venture capital;

-Proposal for the stimulation of the innovative process in companies, especially regarding tax regulations;

-Proposal for the utilization of results of community research.

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CSO: 3698/M269

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

EC COUNCIL ISSUES RECOMMENDATIONS ON ESPRIT II DEVELOPMENT

Bonn TECHNOLOGIE NACHRICHTEN in German No 431, 15 May 86 pp 13-14

[Text] With regard to the future development of the ESPRIT research program of the European Community, the Council of the European Community has made several recommendations which the commission should carefully consider when it makes its proposals. In particular, the council recommends the following:

-While maintaining the precompetitive character of future R&D, there should be a growing emphasis on the possible industrial applications and the commercial effects of results.

-In establishing the program's objectives, in addition to an effort to strengthen its strategic character, greater attention should be paid to the specific needs of small and medium-sized companies as well as of research institutes so that in the future they will be more involved, especially through the possibility of participation in new subcontracting activities.

-A concentration of efforts and means through a stronger participation in ambitious programs should be strived for, although not at the expense of performance in the area of transnational cooperation.

-Structure and composition of consortia should be carefully monitored so that the scope of projects is optimized and the number and type of partners is appropriate.

-The financing agreements for the program should be carefully monitored to determine the optimum contribution of the Community to the individual forms of organization and projects.

-The complementary character of R&D at the level of individual states and the Community should be promoted through a more efficient cooperation and better information exchange between the ESPRIT program and similar programs which are run on the level of individual states.

-The Commission should ensure that the ESPRIT administrative panel has access to all relevant information which would enable it to fulfill its duty of supporting the Commission in the strategic management of the program.

-The Commission should develop a general strategy for the distribution of information and research results. Current procedures and mechanisms should be reviewed and improved where necessary, because their efficiency is decisive for the final success of the program.

-Guidelines should be established which include the criteria and modalities for access of organizations from EFTA countries to the ESPRIT program, where their participation in specific programs depends on the consent of the project partners.

-The program's technical results to date are to be assessed in the supplementary report which the Commission intends to present to the Council in October 1986. This assessment is also to apply to the following areas:

- possible commercial effects and industrial application of the projects;
- problems regarding the size and composition of consortia;
- cost/benefit ratio corresponding to the prevailing rate of the financial subsidy;
- use of personnel within the framework of the ESPRIT program in relationship to the general employment level in the Community;
- special issues for the participation of small and medium-sized companies.

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## WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

### EEC COMMISSIONER ON TECHNOLOGY POLICY

Amsterdam COMPUTERWORLD in Dutch 12 Aug 86 p 5

[Article by Jan Schils: "EEC Commissioner Karl-Heinz Narjes: EEC Must Make Greater Efforts in High Technology"; first paragraph is COMPUTERWORLD introduction]

[Text] Brussels--EEC commissioner Karl-Heinz Narjes has recently said in Brussels at his presentation of the new framework program for research during the 1987-1991 period that a united European market is out of the question if the EEC countries do not succeed in mastering a larger share in high technology. If they do not, Narjes thinks the EEC countries will not be able to compete successfully with countries such as the United States and Japan.

The new framework program was approved by the European Commission on its latest weekly. The program's principal aim is to restore the competitiveness of European companies so as to enable them to compete with American and Japanese companies. The European Commission earmarked some 18.5 billion guilders for the new framework program, 60 percent of which will be used to increase Europe's competitiveness.

Since technology policy has been integrated in the European Act which was added to the EEC Treaty, the currently published framework program must be approved unanimously by the European Council of Ministers, whereas the individual programs require only a majority vote. According to Narjes, the new framework program will "already" be submitted for approval to the European ministers of science in December, which is rather late as the program is due to start in early January.

That the amount currently being proposed by the European Commission is somewhat smaller than the initial proposal is due to the opposition of France, the FRG, and the UK. Moreover, a reserve fund totaling 15 percent of this amount to buffer unexpected expenditures has been canceled. These funds will be allocated to other research programs already underway. After 3 years all the projects of the new framework program will be evaluated. "By then the European Treasury may be better off so that more funds can be allocated," Narjes says.

Further development of information technology occupies a central place in the new program. According to data provided by Narjes, the competitiveness of two-thirds of Europe's economy and 55 percent of European employment depend on information technology. Furthermore, Narjes declared that the development of modern telecommunications systems and new services must be accelerated. "Thus the BRITE [Basic Research in Industrial Technologies for Europe] program will be expanded, because traditional industries must make more use of new technologies," Narjes says.

The new program will also pay particular attention to public health, environment, and energy (nuclear fission and fusion). Concurrently subjects such as security, waste, and energy saving will get more attention. It is evident that the disaster in the Chernobyl nuclear power plant is the main reason for this. The European Commission seeks a greater role for small- and medium-sized companies in this matter.

#### Questions

However, some questions arise. The first one is whether the funds allocated for this program are well invested. Europe's investment in these matters is insignificant compared to those of the United States or even Japan. The EC remains divided despite the present opportunity to fight together against the American and Japanese threat.

The large countries that are not interested in increasing European R&D expenditure give priority to national R&D investments the results of which should benefit their own industry. In fact Europe has rejected real cooperation and decided to waste money and knowledge in doing everything twice or thrice.

For many years Japan and the United States have shrugged their shoulders at this incomprehensible European discord. Apart from some very successful programs, this persistent division remains harmful for Europe.

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WEST EUROPE/ SCIENTIFIC AND INDUSTRIAL POLICY

FINNISH LAW PROPOSAL ON R&D POLICY, INCREASED FUNDS PROMISED

Helsinki HELSINGIN SANOMAT in Finnish 27 Sep 86 p22

[Editorial: "Respect for Science Rises to a New Level"]

[Text] Higher education and research can be particularly content with the government's budget proposal this time. Among the initial comments, however, it was noted that one swallow does not necessarily a summer make, or what is involved is a decision concerning only 1 year. Namely, long-term involvement is after all typical of research that produces results.

The government has now submitted a bill to Parliament for a law on the development of university institutes. It covers the period from 1987 through 1996. In connection with this a Council of State decision has been announced that covers the period from 1988 through 1991. The new development law and the Council of State decision form a whole that will brighten the universities' prospects far into the future.

Scientists certainly did not dare to anticipate that we would at this time be protecting by law the real growth of university institute funds for the next 10 years. Furthermore, the Council of State decision in question promises to increase in real terms the chief appropriations for research and the training of researchers during the period in question by at least 15 percent a year.

The purpose of the new law is also to supervise the application of these increased funds and to create a planning system for it prescribed by law. The desired results will not be achieved through a mere increase in funds unless we at the same time make the operation of the universities more efficient and improve their ability to produce results.

The Council of State decision tells us where this efficiency and the ability to produce results can be found. What is involved are those methods that have also been raised in public discussion for years now: Teachers' duties should be defined more flexibly than at present, cooperation between the universities must be made more effective, the universities must assess the success of their efforts in a more effective way, and so forth.

The government has now obviously swept its own front steps clean and demonstrated that it understands the importance of research and development. After this the limelight is now focused on the universities, which must in future demonstrate their real participation in the effort. Any ineffectiveness can no longer be indifferently explained as being due to a shortage of funds.

Science Minister Gustav Bjorkstrand is quite right in describing these decisions as being the most important ones for the solution of our university and science policy problems for years and even decades to come. He wisely also thanked the Finance Ministry and the entire government for them. We would not have gotten this far without a thorough reappraisal of the situation.

Finnish science is getting a shot in the arm that will in the future turn out to be the best thing for the entire nation.

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WEST EUROPE/TECHNOLOGY TRANSFER

BRIEFS

INDUSTRIAL TECHNOLOGY TRANSFER REPORTED--In a study financed by the Thyssen endowment, the IFO Institute for Economic Research of Munich has examined issues of industrial R&D in the Third World and of technology transfer from industrialized to developing countries. India and South Korea, developing countries with an already diversified industrial structure, were chosen as representative countries for observation. The IFO institute discovered that despite rapidly growing industrial R&D, technology imports both in India and South Korea have substantially increased during recent years. With the growing diversification of the industrial structure, the demand for high quality technologies grew particularly quickly to the point that government controls of technology imports became an increasing hindrance. Both countries reacted with a revision of their former transfer policy: although India merely loosened government control slightly, South Korea, which places more emphasis on the creation of export oriented industries, eliminated it almost completely. [Text] [Bonn TECHNOLOGIE NACHRICHTEN in German No 431, 15 May 86 p 11] 8617/12859

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EAST EUROPE/BIOTECHNOLOGY

BULGARIAN SPECIALIST DISCUSSES BIOTECHNOLOGY PROSPECTS

Sofia OTECHESTVEN FRONT in Bulgarian 8 Sep 86 p 7

[Molecular Genetics--a New Era for Mankind]

[Text] Interest in molecular biology and genetics has increased sharply in the last few years. There is hardly anyone nowadays who does not know about the enormous practical value of these scientific discoveries in agriculture, medicine, and industry. Biotechnological methods have already become commonplace. But fundamental discoveries in genetics also have an enormous ideological significance (about which, for whatever reason, we seldom speak). With the deciphering of the genetic code it has become possible to understand the material basis of molecular entities and the continuity of life; in other words, a formal science has confirmed the truth in philosophical materialism, which, as we know, is the foundation of the Marxist-Leninist doctrine.

The development of molecular genetics requires modern man to form a new ideology: an ideology which will prevent the explosive development of technological progress at the expense of nature.

Bulgarian biological scientists have worked for a long time and as much as possible on solving these problems. In the last few years however, there has been a definite advance and improvement. This is the reason for inviting one of our best known molecular geneticists, Professor Asen A. Hadzhiolov, for an interview.

[Question] Prof Hadzhiolov, what have been the fundamental achievements in biological sciences in the last few years?

[Answer] It is difficult to give a short answer to such questions, but if we are to select the most essential, then I must emphasize that the last decade is noted for exceptionally rapid development of cell biology as a synthetic science, studying cell structure (morphology), function, and genetics as a system. A special characteristic of modern cell biology is the ability to study cells of multicellular plants and animals, including man. This notable expansion of possibilities in biological science is a result of the elaboration and implementation of methods for genetic and cell engineering, as well as the ability to obtain and use monoclonal antibodies.

It can definitely be said that the mainstream of modern biology flows in the direction of application of these methods to understand the secrets of cells and organisms. It is well known that this direction of the development of biology creates the scientific foundation for advanced biotechnological methods, which are being applied more and more successfully in industry, agriculture, and medicine.

[Question] What would you describe as the fundamental achievements of the Morphology Institute?

[Answer] The Morphology Institute at BAS [Bulgarian Academy of Sciences] has a long tradition. The name of its founder, the academician A.I. Hadzhiolov, and those of distinguished Bulgarian scientists - Member - Correspondent D. Kadanov, Professor Zh. Yordanov, Professor I. Goranov, Professor M. Moskov, Professor P. Boev, and others - are intertwined in its evolution. Most recently the institute has been researching more and more successfully vertebrate animal and human cells. Its accomplishments in blood, reproductive, and nerve cell research are highly valued in scientific circles and this gives us the opportunity to collaborate productively with scientific teams from the Soviet Union and other countries.

Our institute is a pioneer in the country on implementation of hybridization methods for obtaining monoclonal antibodies. Some of them, such as those against viruses and rickettsias, as well as those against normal and cancer cells, are especially important for the future of applied medicine. In the last few years the institute has been rapidly adopting the procedures and methods of modern cell biology.

[Question] During an interview, the well-known American biochemist Paul Berg spoke apprehensively about the need nowadays for all scientific research to be motivated by some practical goal which, according to him, limits the horizon of scientific imagination. The majority of the most important achievements in the field of oncology, for example, started in research that had nothing to do with cancer. The history of science also demonstrates that major discoveries have been made not because of the need to fulfill some concrete and practical task, but simply because some scientist was curious to learn something, something more....

[Answer] Science provides our knowledge about nature. To be capable you must have knowledge. The strength of science is hidden in this simple truth. Anyone who expects to obtain fruit from a tree without roots is a fool. Science provides the roots of man's contemporary work. What must you know to solve a specific practical problem is a different question. In this respect, science is always motivated by its practical application. I do not know of any scientists who do not try to acquire precisely the knowledge which would help increase the working potential of man. At the same time, not every scientific discovery can be immediately put into practice. Very often a whole series of scientific discoveries is necessary to solve a specific practical problem. Icarus too, wished to fly, but obviously his scientific knowledge was insufficient.

[Question] And how do you evaluate the influence of science on the ideology and philosophy of modern man?

[Answer] When you bit into a juicy apple you don't think of the tree and its roots. But if we think about it, we must definitely say that the contemporary scientific and technological revolution in biology has an enormous ideological significance. With achievements in molecular genetics mankind has entered a new era, the era of improved knowledge and control of the heredity of living organisms, including man. Nowadays people know a great deal and, naturally, are capable of a great deal. This in principle requires a new, much more responsible treatment of the living world.

[Question] Speaking of ideology, do you think that biological heredity is sufficient to make man a human being?

[Answer] No, it is not sufficient. The nervous system of higher vertebrates and man has a genetically stored potential for learning and assimilating knowledge according to each species. Some call this social heredity. In man it is exceptionally well developed and it is simply inconceivable for man to become a human being without it.

[Question] What will your coworkers inherit from you? In general, how do you find your followers and associates in science?

[Answer] These are very difficult questions. What they will inherit from me will be known when I am no longer around. For now I want my coworkers to work harder and be smarter than I am. And above all, to aim clearly at the highest levels of achievement in science.

[Question] Does this mean that we can rest assured about the future of Bulgarian molecular genetics?

[Answer] Molecular genetics forms the basis for cell biology; it is a pillar in the modern scientific and technological revolution of the life sciences. Without doubt, by the end of the century these sciences will increase a great deal man's knowledge of animate nature and will help solve many practical problems now facing mankind. I am an optimist regarding Bulgarian molecular genetics. Our nation is talented and there are many young people coming to us each year. The material resources necessary for the development of molecular genetics and cell biology are still sufficient for a small country like ours. In this respect the decisions of the party and the government give deserved recognition to the strategic significance of these sciences for the future of our country.

Interviewer: Paun Tsonev

Calling Card

Member-correspondent, Professor Asen A. Hadzhiolov, doctor of biological sciences, is head of the section "Molecular Genetics" and director of the Morphology Institute at the Bulgarian Academy of Sciences.

He was born in Sofia in 1930. A graduate of the Higher Institute of Medicine, he later specialized in biochemistry, molecular biology, and genetics under the guidance of Nobel Prize winner, Professor F. Lipman in New York, Professor F. B. Schtraub in Budapest, and Professor R. Vandrelli in Paris. During 1970-1971 he worked in the National Institute for Medical Research in London and in 1974 he was a professor at New York University. [The text is unclear whether the reference is to New York University, City University of New York, or State University of New York.]

The most important part of his scientific work is dedicated to molecular mechanisms of cancerogenesis, structure and transcription of genes in eukaryotic cells, regulatory mechanisms of gene translation in animals cells, and others. For his scientific research he was awarded the title "Dimitrov Prize Laureate" in 1980.

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EAST EUROPE/COMPUTERS

ORGTECHNIK CONFERENCE SLATED FOR OCTOBER IN BUDAPEST

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 1

[Text] "We have outgrown the Budapest International Fair!"--this was on the title page of the farewell issue of SZAMITASTECHNIKA. Accordingly the conference of Orgtechnik and the special exhibit of organizational technology devices and their applications becomes an increasingly significant program.

Orgtechnik will be held for the sixth time between 3 and 8 October by the Organization and Leadership Scientific Society in cooperation with the Janos Neumann Computer Science Society and the National Leader Training Center. This year there will be about 120 exhibitors in the Budapest Sports Hall. The number of domestic exhibitors has not increased therein. Six enterprises from socialist countries and 14 from capitalist countries will show their products, which represents a modest increase. Talks are taking place concerning use of the SZEKIR (Exhibit Information System for Computer Technology and Organization Technology Devices) which was developed by people at Datorg and which worked well at the Budapest International Fair; whether this would be economical is still a question.

There is less interest in the conference on the same theme which will take place between 6 and 8 October, also in the Budapest Sports Hall. In the next issue of our journal we will map out the new items to be expected and in November we will return with an analysis to the exhibit which is expected to attract many visitors.

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## EAST EUROPE/COMPUTERS

### LOWER CUSTOMS SEEN SIGNIFICANT IN LOWER PRICES

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 2

[Article by A. K.: "Moderated Duties--Cheaper Prices?" It appears that all but the introductory paragraph should be attributed to Sandor Bottka of the National Technical Development Committee.]

[Text] Beginning 1 July of this year, in accordance with a government decision, there was a significant moderation in the duties on state import of some microelectronic and robot technology products of capitalist origin which are important from the technical development viewpoint. The reduction, of about 55-75 percent, applies to the following devices among others: a computer controlled light collecting system, the associated image digitizer, laser printers, alphanumeric and graphic displays, text editing processors; flexible manufacturing systems, metal industry robots, manipulators and their controls, robots serving electric laser soldering, welding and cutting machines or devices and their controls; input and output peripheral equipment which can be connected to a digital data processing machine, technological process control equipment or intelligent measurement systems (built into systems and separately, which can be connected via synchronous or asynchronous channels, a V.24 interface, a computer bus system or teleprocessing channel); automated designing systems and equipment (CAD/CAM), conversational computerized CAD systems (built in or separately), raster picture tube and vector displays, graphics peripherals, positioners (mouse, light pen, etc.), operator menu tablets, image processing processors, digital image disk stores (CD), figure digitizers, local computer nets and their equipment--central and connected computer with peripherals, terminals, network tools; and microprocessors.

We talked with Sandor Bottka (OMFB [National Technical Development Committee]) about the causes and expected effects of the customs moderation.

Within the framework of the government electronification program it is the aspiration of the government to accelerate the use of electronics in the economy and to ensure conditions for this so that the enterprises will want and be able to electrify more easily. The customs moderation can be regarded as one element of this. Parallel with this there was a resolution of the State Plan Committee which reviewed the entire innovation chain and within this framework came to the conclusion that today certain customs fees hinder technical development. It is not possible now--for reasons of thrift--to

reduce the customs fees on every item the lack of which hinders technical development but steps had to be taken in the most exposed areas, namely in the area of use of robots and electronics. Obviously this measure in itself does not provide the foreign exchange needed for acquisition, but he who has the foreign exchange for it will now import equipment falling under the duties suspension (moderation). The essential thing from the viewpoint of the user is that customs costs are at the very beginning of the enterprise costs calculation. So that everything added to it--overhead, the enterprise general costs and practically the entire withdrawal system and all the fund generation systems--start from here also. Knowing the costs calculation system, the new decree may be a more significant factor in price than the magnitude of the customs reduction itself, which amounts to 55-75 percent (see table).

Customs Reduction Valid from 1 July 1986 For Microelectronic and Robot Technology Products Important From the Viewpoint of Technical Development (taken from the joint decree of the Ministry of Foreign Trade and the Ministry of Financial Affairs, No 3/1986 (VIII. 10.) KKM-PM)

Category	Customs Fee in Percent		Reduction in Percent
	Earlier	After 1 Jul 86	
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Computer controlled light collecting system	25	9.8	60.8
Technological system (FMS); robots, manipulators and their controls	40	11.4	71.5
Input or output units and storage units, also together with other parts of the system	20	8.9	55.5
Automated designing system and its equipment (CAD/CAM)	20	8.9	55.5
Local computer network and its equipment	20	8.9	55.5
Robots serving machines and devices in customs category 85.11 and their controls	50	12.1	75.8
Microprocessors and their driving and control circuits; storage, interface and linear circuits in traditional and surface mounting versions	25	9.8	60.8

The provision does not apply to microcomputers. It is difficult to conceive of a C-64 as a CAD/CAM system. One should know, concerning the electronification program, that the electronic equipment manufacturing industry is not programmed into it. Basically this customs reduction is for the end users and only in places does it extend to areas in which the equipment manufacturers are also interested. So CAD/CAM, a flexible manufacturing system, etc. are for the end user. In the case of microprocessors, for example, the duty had to be moderated because one can use them for the intelligence or controls needed for the given task. This sort of service must be encouraged! The manufacturers of

classical equipment will be better off to the extent that they build in this sort of thing.

It must be emphasized that this provision applies to state import; there are entirely different rules for tourist import or private import. This does not apply to them. It does apply to small undertakings if they import the products through a state foreign trade enterprise. The equal chances of the large enterprises and the small undertakings must be seen to, but not in connection with customs. In our judgment the large enterprises should be put into a competition situation which, in many cases, the small undertakings are in already; and other problems should not be settled in the course of customs measures. These differences exist between the small and large undertakings whether the duties are high or low. The difference will not change substantially from this regulation itself. We trust that economic regulation will develop in such a way that the large enterprises will be made at least as flexible and will be put into a situation in which the small undertakings are already in many respects.

In this customs reduction I consider most significant those items which go to the end user, such as flexible manufacturing systems, local networks and CAD/CAM systems. For these items the supply is very modest, very moderate. But the scale for a CAD/CAM system, let us say, is very broad. So it could be that a small domestic undertaking offers its system as a CAD/CAM system, or as a local network, but if we look into this local system then it turns out that Commodore-64's are being tied into a quasi-network. We are not thinking of these. For example, in the case of the LAN, this brings domestic manufacturers a little bit closer to world market competition. Obviously this world market competition will not develop here overnight. And wherever we look we see that we do not have the capital and expert concentration which would make the chances even in this competition. I see the essential thing in helping the users. The problems of the equipment manufacturers, their technological development, must be solved in a different way. This measure will help here too in part, for example, in the case of submicron processing or certain control equipment, in-circuit testing.

The total effect of the customs moderation could result in improving the technical level and efficiency of the economy and it could contribute to reducing the price level of electronics applications. If the customs reduction leads to starting processes moving in this direction then it will be worth using customs as a tool in the future also.

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EAST EUROPE/COMPUTERS

OFFICIALS DISCUSS PRICE POLICY FOR COMPUTER RELATED PRODUCTS

Market Price as Guide

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 3

[Article by J. A. V.: "A Guide Instead of the Guide Price: The Market Price"]

[Text] He who says price should say.... What should he say if he should not say price calculation? Is there really nothing else to say?

The computer center leadership department of the NJSZT [Janos Neumann Computer Science Society] invited as speakers to one of its summer programs Lajos Varga and Jozsef Szabo from the KSH [Central Statistics Office], Bela Berci from the National Materials and Price Office, Gyorgy Palos from the Authors' Legal Protection Office and Janos Hegedus from the Ministry of Financial Affairs in order to clear up misunderstandings and anxieties concerning the generation of prices for software products and computer services. Of course, the person who really knows how to dispel anxieties is the person who gave rise to them, but no one wanted to come to the meeting to represent the Control Chief Directorate of the Ministry of Financial Affairs; they only sent word to the 150 computer center leaders present that they would check what the price authorities had ordered, nothing more. Even this is information, so let us see how the price authorities dispel the anxieties.

The representatives of the KSH got the most questions about the guide prices, but it was said even in the introduction that one of the goals of the current 5-year plan of the branch was to eliminate the guide prices by the end of the plan period. It turned out from the answers that there is no need to wait for this, even now it would be worth while to contract with job prices or lump sum prices, which say more to the customer, instead of the old (cost centric) machine hour fees.

The formulation of the price office was even less ambiguous, if possible. The two factors determining the price are the market and the cost; of these the market has precedence. Even the calculated price, with a small profit content, can be unfair if it is the result of wasteful costs management, while a price hiding a large profit is not unfair if it fits into the price relationships which have developed and the price is the result of a market bargain (and does not take advantage of the economic situation).

For our journal the speakers have summarized in writing their answers to the most essential questions. Of the two price authorities the chief of the main department at the National Materials and Price Office has written down virtually everything on how prices should be developed; the department chief from the KSH describes how the prices do develop, how they have developed. (We will publish in a subsequent issue the article by Gyorgy Palos about authors' rights and the regulations connected with them.)

#### Computer Product, Service Prices

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 3

[Article by Bela Berci, main department chief, National Materials and Price Office: "Price Formation for Computer Products and Services"]

[Text] One of the conditions for the realization of our economic policy goals is the operation of a price system in which the prices correctly orient decisions corresponding to national economic interests and urge both producers and consumers in the proper direction in their economic decisions.

The price control provisions passed as of 1 January 1985 place the value judgment of the market, no longer primarily costs, in the center of price formation. In accordance with this the method for forming prices can no longer be the computation of prices but rather the development of a price corresponding to the market relationships, letting it collide with the exactly determinable direct costs. A development of prices in accordance with our goals can be realized only if the market regulates the price, while the state regulates the market.

In the past period a market situation developed in the area of computer technology which created the conditions for competition and so it became possible for market effects to be realized in prices. The change in requirements has appeared in the price control provisions as well.

Accordingly, Council of Ministers decree No 38/1984 (XI. 5.) MT concerning price regulation sets forth as a general principle of price generation that the price for the product and the fee for the service must be developed on the basis of the market relationships, taking justified costs into consideration.

The price control decree, when it places the emphasis primarily on market relationships in price formation, also recognizes this by putting an end to the obligatory character of calculation costing in the case of computer services. Accordingly, the price or fee applied no longer need be supported or documented by calculation costing.

This exemption from the preparation of calculation costing does not mean that price formation by the managing entity should become unfounded. In this connection it is justified for those performing computer services and producing goods to measure the costs of production or service in accordance with what is contained in the provisions pertaining to cost-accounting for computer services and goods up to and including direct production costs. But the economic calculation thus prepared is no longer aimed at computing the

price, rather it is aimed at determining the lowest price limit to which one can agree in the price bargain with the customer or client. An agreement above this lowest price limit offers cover for general costs and profit (taken together, gross cover).

After this the question arises as to what price one can object to, which, in other words, qualifies as an unfair price. Council of Ministers decree No 31/1984 (X. 31.) MT concerning determination of an unfair price offers guidance in this regard.

According to the Council of Ministers decree that price is unfair which does not fit into the price relationships, which is disproportionately high. The disproportionately high nature of a price must be judged by taking into consideration the novelty of the goods or service, the sale conditions, time limits, payment conditions and the special demands of the customer. The price cannot be higher than the price of similar goods acquired from convertible accounting import.

Price practice takes into consideration the special character of computer services and goods, where intellectual activity is a determining factor. For this reason control weighs the question of proportionateness from other viewpoints. In general it does not examine the disproportionately high nature of the price when the agreement of the seller and customer or client and provider pertains to an invention or to the creation of a commodity having an innovative character, to technical development, research or other innovative activity or to a service of an expressly organizational character. Especially if these appear as a not regularly recurring commodity or service. At such times the investigation is directed at whether or not the magnitude of the price is interdependent with the appearance of costs which derive from lack of organization or bad work discipline so that the price covers expenditures which are unnecessary to achieve the quality and other requirements prescribed in the order. Special emphasis is given to classifying a price as disproportionately high if it contains an unnecessary intermediary fee.

The price investigation concentrates on whether, at the time of the price agreement, advantage was taken of economic superiority, there were tie-in goods, or other action in conflict with Law IV, 1984, forbidding unfair economic activity.

In connection with the above two questions should be raised in regard to price formation for computer goods and services: One is the problem arising in connection with the number of copies of a software product and the other is a one-sided appeal to supply and demand.

When developing software prices special attention must be turned to whether the software sales can take place in multiple copies. For this reason one must weigh the possibility of sales with special care in the course of price formation. If, on the basis of past experience, we make a software product which usually is sold in multiple copies then the number which can be sold must be taken into account. When determining the number of copies one can weigh the average number of copies in earlier sales, the utility of the software and the price relationships which have developed on the software

market. If we strive for a good foundation in the course of price work it is absolutely necessary to measure the expected costs. As I said earlier, the accounting for costs takes place in the economic calculation. The economic calculation is a tool for economic decision making and so its goal cannot be to compute an ever higher price but rather to determine the magnitude of the expected costs. It follows directly from this that one cannot imagine the planning of real costs without figuring out how many copies of the software might be sold. And the number of copies sold influences the magnitude of the costs.

It appears unambiguously from the provisions described above which limit price formation that the efforts to be economical and the purity of our price work therein require that we develop our prices by weighing what has been mentioned. This also means that the justification for a price is not, in itself, proven by the fact that the client or customer has accepted the price used by us.

To sum up what has been said, I feel that our present price mechanism not only makes possible but also aids the development and spread of computer technology.

#### Product, Service Price Formation

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 3

[Article by Jozsef Szabo, department chief, Central Statistics Office: "Price Formation for Computer Technology Products and Services"]

[Text] The Planned Directions of Market and Price Control

Market trade in computer technology applications products and services within the sphere of price control rose from 3 billion forints in 1980 to nearly 8 billion forints in 1985. The increase in trade took place with an average annual drop in the price level of 3.3 percent.

The planned value of market trade for 1990 is 14-16 billion forints. We plan to realize this increase by increasing productivity, at an unchanged price level, presuming a price decrease for computer technology tools. The task of price control is to ensure this unchanged price level.

The economic reserves for the reduction in the price level thus far are being exhausted at the managing organizations. (As a result of price measures and the developing competition the profit rate of the enterprises has dropped, from 22-25 percent at the beginning of the plan period to 16-18 percent.) A further price decrease would hold back the developmental possibilities and expanded reproduction of the branch. Increasing wage, materials and energy prices will compensate for the expected increase in productivity, so we cannot count on a general price level reduction in the plan period, we can only count on holding it.

Within the unchanged price level we can plan price reductions for machine services--as a result of the decrease in machine prices, in the event of series manufactured software--especially for the microcomputers used in larger numbers, and we can count on a price increase in the case of custom software preparation and for highly wage intensive data recording services.

Supply has increased on the market for computer technology applications products and services in recent years and the competition situation has strengthened. This movement toward a market balance and the change in price policy gradually made possible a resolution of the price restrictions. We could shift from production cost type price generation to price generation based on the buyer-seller value judgment. Within the framework of this there was an end to obligatory calculation costing and after 1983 the definite guide fees remained in effect only for machine services. Price studies have shown that in the freer price formation environment the sellers did not have an opportunity to raise prices. So the market relationships which have developed are suitable for maintaining the price level at the planned level, with an active market animating policy.

Effective 1 January 1986 we introduced an average 10 percent guide fee reduction to encourage a price reduction for the machine services which are still significant in weight--the providers here still have a regional and branch monopoly situation. We plan to eliminate the guide fee system by the end of the plan period, building on expanding market value judgment. We intend to track the development of prices through annual checks and market surveys and we intend to take the necessary price authority and market supervision measures.

#### The Development of Prices and Fees, the Guide Fee

The change which has taken place in price control, the shift from production cost price generation to prices based on the market value judgment, is accompanied by a change in the base for price generation.

In the case of production cost price generation there was a natural effort to generate prices according to resources, to develop so-called intellectual and machine hour prices, even if what was being sold was an independent product, a copy of a program, and not the providing of the resources.

A price based on the market value judgment must be based on the price the customer will pay, in which he can compare the product and service he purchases with the price of another similar product, or one which can take its place, or with the performance he can check. Thus the price of a program product must be determined by the price of other products and the fee for machine service must be determined by what is accomplished, for example by the number of files processed, etc.

The base for prices must be selected in such a way that the customer can evaluate the performance purchased, while resource use--the factor for the economic calculation of the seller--serves to calculate the freedom of movement of the offering price.

Use of the guide fee is not obligatory, one can deviate from the magnitude of it and from the price generation base. This deviation is especially justified if the content of the service does not coincide with the price generation base for the guide fee, if the subject of the contract is not merely providing machine resources.

#### Price Generation for Software Products, Price and Author's Fee

The general price generation rules are valid for generating prices for software products; the price can be developed taking into consideration the justified costs and weighing the market relationships.

When developing prices for custom software products or those which can be sold in one copy or in multiple copies one can take into consideration the difference in copy prices in addition to the justified costs and the market relationships (the number which one expects to sell and the direct costs per copy).

That price is not unfair which fits into the price relationships, thus which is not unjustifiably higher than the prices of similar products or those which can take its place--also weighing other market factors (quality, related service, time limits, etc.). Thus when determining the price for software products which can be sold in multiple copies one should adjust the price to the price relationships of products being traded on the market.

The fee for leasing a product can be generated from the product price. When developing the lease fee one should take into consideration the product and lease fee ratios which have developed on the market and develop a fee level which fits into those price relationships.

The valid regulations interpret leasing activity as a special case of rent. The size of the leasing fee is developed starting from the product price and taking into consideration the cost and interest fund conversion. In the case of the leasing fee level for applications program products one must consider that the product price of them, unlike the purchase of fixed assets, does not burden the interest fund of the customer.

The author's fee cannot be regarded as the price of a software product but rather as a property right attached to the person of the author which provides income to the author depending on the use contract in an amount determined in the regulations.

If the software author sells copies of his product then the price should be determined by the price regulations pertaining to software products.

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## EAST EUROPE/COMPUTERS

### STATE INSURANCE COMPANY NEEDS COMPUTER NETWORK

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 4

[Text] The firm which wins the bid pertaining to delivery of microcomputer networks to the State Insurance Company (AB) can ensure its annual profit, and it will have no marketing problems in 1987-88 either.

This was disclosed among other things at a press conference of the AB, which has been operating in a new form since 1 July. A competition situation has developed in the area of insurance; the simultaneous presence of the AB and Hungaria on the market is encouraging both institutions to provide clients with better, faster service. And this means, among other things, a modernization of the conduct of business and mechanization of data processing. Even previously computer technology was not unknown at the State Insurance Company; file recording, damage statistics and other batched processing was done in Budapest at the Financial Computer Technology Institute and in the provinces at the SZUV [Computer Technology and Management Organization Enterprise]. But the area best mechanized thus far--the online system for vehicle and international insurance--went entirely to Hungaria together with the equipment. In addition to maintaining the contract work processing the AB must now see without delay to the building up of a network according to a uniform conception.

We received details about the large project from Jozsef Dornyei, business director of the State Insurance Company. They requested bids from six firms to realize the new system and on the basis of an evaluation of these the MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences] was commissioned to prepare a system plan.

In the first phase--up to 1988--every AB office (about 230) will be equipped with a local microcomputer network. The chief task of the LAN's, consisting of one control machine and 3-5 work stations, will be to service and process the 20,000-40,000 insurance policies of each office, maintain the files, account for premiums, account for and keep records on wages and calculate commissions. This will require primarily realization of an efficient database management function.

In the second phase the aggregated data of the several branches will go into the computers of the county directorates and finally the machine to be installed at the AB center will receive and process data flowing in from all parts of the country. On this basis they can prepare those statistics and models needed to develop business policy and make decisions in the case of an institution operating under market conditions with an interest in profit.

It appears that the new organizational frameworks now offer a possibility for carrying out a consistent development proceeding from below upward the result of which can be measured not only by the State Insurance Company but by every insured person, practically by every Hungarian citizen. So if they succeed in realizing the good ideas the competition will have very many winners.

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EAST EUROPE/COMPUTERS

NEW VIDEOTON COMPUTER FACTORY DIRECTOR

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 4

[Text] Following the tragic automobile accident of Istvan Papp, the minister of industry has appointed Janos Kazsmer to be director of the Videoton Electronics Enterprise, using the title of director general.

Janos Kazsmer joined the enterprise 30 years ago with his new diploma after graduating from the Miskolc university. After assignments as chief technologist and main department chief he was named developmental chief engineer and then, in 1971, director of the Videoton Developmental Institute. In 1972, when the Computer Technology Factory became an independent factory instead of a factory unit, he performed the director's tasks for it together with the VIFI [Videoton Developmental Institute].

He was appointed technical director of the entire enterprise in 1983 and less than a year ago he also was given the title of deputy director general.

After the death of Istvan Papp he was for a short time the acting director general and since 15 August 1986 has been director general of the Videoton Electronics Enterprise.

The successful work he has done at the head of the largest factory of domestic computer technology is recognized by government decorations and by such professional recognition as the Eotvos Prize and the Neumann Medal.

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COMPUTERWORLD-SZAMITASTECHNIKA AIMS TO PLEASE DEMANDING READERS

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 6

[Article by Dezso Futasz: "Will We Hit What We Are Aiming At?"]

[Text] A quarter of a century ago a total of five computers were operating in Hungary. Today the inventory is about 1,300 large and 12,000 mini or professional microcomputers. There may be between 50,000 and 100,000 "home" computers, maybe even more, no one has precise data. The estimated total value of the present "official" inventory is more than 23 billion forints, which is about three percent of the annual national income. In the past year Hungary spent about four billion forints on microelectronics research and development. We know of more than a hundred larger and 600 smaller Hungarian firms or undertakings manufacturing or providing computer technology devices. According to the statistics the number employed in the area of computer technology exceeds 25,000; the number more or less directly interested in using computer technology may be at least four or five times this amount.

Devices, money, people. Important and expensive resources; to provide news about this, spread clever applications, make people think about the foolish ones--this will be, for the most part, the job of our journal.

Other numbers and experiences less convertible to data show that the computer technology equipment being used in Hungary is operating less and at the same time less efficiently than the Western European or overseas average. And those considered farther ahead here are not always satisfied with the profit which their serious computer technology investments yield. According to the most recent American studies electronic data processing, an area of at least equal rank with production control and computer aided designing, did not necessarily increase the efficiency of data recording and data providing work despite the many billions of dollars invested in the past 20 years. The analysts see the reason for this in the fact that for the most part the plants, institutions and offices using computer technology ignored the basic truth that computerized confusion remains only chaos. A computer does not help a lack of organization in production or irregular operations--neither there nor here. At most it does more quickly those long since superfluous operations which derive from irrational structures.

It is the task of our journal to help dispel the rosy fog of myths which transform the use of computer technology into a magic spell, a fog which some of the profession--out of understandable interests--are not rushing to dry up, a fog behind which rather hard walls await the head of the user rushing in unsuspectingly. In the longer run only the informed user and an extensively informed developer or manufacturer, looking beyond his professional sphere, can live satisfactorily together. A lack of information on either part leads to disillusionment and altercation and this--considering the ever more significant computer technology investment--cannot be permitted. For this reason COMPUTERWORLD-SZAMITASTECHNIKA, the journal of the profession, wants to be the journal of demanding users.

This is a fragmentary "program statement." Intentionally so, for we do not need to make declarations, we need to work; the consumers, the readers, will judge the paper not on the basis of good intentions but rather on the basis of value and utility. But we would add something more to the foregoing. The Hungarian computer technology professional press of the end of the 1980's certainly cannot ignore the fact that since the beginning of the decade this professional area has changed radically in our country too. The price of microelectronic parts is plunging around the world, their performance is still increasing, so the price-performance ratio is increasingly favorable. The "implosion" of microcomputers has expanded the circle of users to a never expected degree and has created a mass world market for professional personal computers with essentially comparable performance and characteristics. The Hungarian computer technology market is a modest part of this, but still a part, and for the time being--recalling the earlier state of affairs--its greatest virtue is that it exists at all. We will try to contribute to seeing that this market can become a real organizing force; let it not be an arena for "robber knights" but rather a playing field on which the rules applied force the manufacturers, vendors and providers to responsible behavior and prompt the users toward rationality, toward analytical and evaluative thinking, toward proper organization. We hope that all this will not turn out as it did in the case of one of the first publications of our publisher, Computerworld Informatika Limited. In its July issue our professional bulletin titled "compuTREND" published a comparative table of IBM PC XT/AT and compatible machines sold in Hungary. Of the configurations, not entirely interchangeable but still not apples and oranges, the most expensive was over one million forints and the cheapest under 300,000 forints. A week after this appeared the people working at the bulletin looked to see if the public comparison succeeded in breaking somewhat the flagrantly high prices. Not quite. At the firm selling most cheaply they apparently thought that they had played the "good fool" long enough and upped their prices a notch. So a journalist does not always hit what he aims at; from which, of course, it does not follow that he does not have an obligation to inform. That is our obligation.

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PRODUCTION OF XT, AT COMPATIBLE COMPUTERS UNDERWAY

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 7

[Text] Manufacture of XT and AT compatible machines started during August at the New Corn Ear Agricultural Producer Cooperative in Gyor, the Raab Computer Technology Branch, and they have already begun to fill orders for fifty Raab 86/AT professional personal computers. An economic association to be created by the KSH SZUV [Central Statistics Office Computer Technology and Management Organization Enterprise] and the branch will take care of selling the machines, providing basic and applications software and complex system service (this also extends to service activity, continuing consultation and instruction in user systems).

The chief characteristics of the Raab 86/AT are as follows: an 80286 microprocessor, an 80287 coprocessor (optional), a maximum of 1 M bytes RAM, a 1.2 M byte capacity 5.25 inch floppy disk unit, a 20 or 40 M byte Winchester disk store, mono or color monitor, high resolution display (1,024 x 1,024 pixels) and plotter and a TMT 120 matrix printer. The price of the AT with 512 K bytes memory, a 20 M byte Winchester disk unit, color monitor, MS-DOS version 3.1 and BASIC interpreter is 790,000 forints.

The price of the Raab 86/XT with 256 K bytes RAM, a 360 K byte floppy disk unit, a 10 M byte Winchester disk unit, color monitor, MS-DOS and BASIC interpreter is 385,000 forints. Both machines can be delivered installed in a local net (RAAB-NET). In the case of a leasing deal both the AT and XT versions can be obtained with four year time payments.

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PROGRAMMABLE INDUSTRIAL CONTROL SYSTEM ABROAD

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 7

[Text] We could read a lot lately about the capitalist export of Hungarian programs and the successes of domestic software experts. The same cannot be said in the case of domestic hardware developments. The LAOCON programmable industrial control system represents a rare exception. Last year the Australian firm Laocon Control Technology Ltd. (could the name be just an accident?) purchased in the form of a license contract the system developed at MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences] and sold by its subsidiary enterprise COSY. The Hungarian patent combining the most modern achievements of computer technology--local network, distributed intelligence, parallel task solution--controls various types of machines and equipment in a way which is new even on the world scale.

Within the framework of the Hungarian-Australian cooperative manufacture, which has started already, the mechanical elements will be made here and the complete electronic units will be made in Australia. COSY plans production of 500 subunits this year.

More recently, after Australia, Denmark also has noted the advantages of the LAOCON system, for example that the microprocessor modules can be installed on the controlled equipment directly at the site of intervention; communication can be conducted over a single cable instead of the expensive cable bundles.

COSY has signed a contract with the Danish firm Labotek and cooperative manufacture has begun on the basis of it. According to the newest information COSY is also conducting talks about setting up a joint enterprise headquartered in Western Europe.

In the meantime, naturally, LAOCON is winning ground here at home too; the Debrecen factory of the Hungaria Synthetics Processing Enterprise uses the system to control an injection molding machine, Intranzmas is using it to control a suspension rail track and a high warehouse loading machine and the Keszthely Thermal Power Plant is using it to automate its external network.

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PHYSICS INSTITUTE'S PLANS FOR ES 1045 COMPUTER

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 7

[Text] There has hardly been a greater investment in the Academy institutes in the past 5 years. The July delivery of the ES 1045 computer system concluding the first phase of the computer investment program of the KFKI [Central Physics Research Institute], a program lasting several years, together with the Debrecen cyclotron, can be regarded as completed. With this system, worth more than 100 million forints and belonging in the second series of ESZR [Uniform Computer Technology System] machines, they hope to raise the level of computer services and thus of the basic and applied research being done in the research center. The ES 1040 computer, operating for almost a decade, is not able by itself to satisfy the significantly increased needs. At the same time it must be noted that however significant the extra services offered by the ES 1045 it does not represent a complete solution for the institute.

According to the plans a local network will be established by the end of the year or the beginning of next year. This will link together the computer center, the various megamini configurations manufactured by the KFKI and the professional personal computers.

As part of the investment program the computer center configuration will be supplemented, probably next year, by an IBM compatible processor with power similar to the ES 1045.

The ES 1045 system which has been delivered, with 4 M bytes of operating memory, has been supplemented by highly reliable, twin drive magnetic disk units (SZAMALK [Computer Technology Applications Enterprise] 556M control and 506M drive), so the capacity of the background memory totals 2 G bytes. Thirty ES 7917 picture screen Mera terminals are connected to the system. The basic operating system is OS/VSI. SZAMALK is providing complex service. The local network will be based on the 1 M bit per second transmission speed Lochness system developed at the KFKI. A TPA-11/440 megamini computer will link the ES 1045 and the local network. According to the plans the local network will be made compatible with Ethernet later. They are already planning a link between the ES 1045 and the Academy Computer Network (ASZH) also.

The 4 M bytes memory capacity and virtual memory management will greatly aid in loading and running the large programs serving various types of research. In addition, if the central machine is linked to other institute computers through the local network, it will be possible to make use of the resources found on the ES 1045 from the remote computers. This means both the transfer of files and initiating the running of programs. With the IBM compatible machine to be placed into operation the two-machine configuration will increase reliability to an extraordinary degree.

Realizing these plans will lay the foundations for further steps toward creation of a national informatics network which will be part of the development of the research and development infrastructure. The goal is to link the computers into a uniform network to get to the several institutes the information needed for research.

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SOCIALIST MICROCOMPUTERS COMPATIBLE WITH IBM PC

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 pp 24-25

[Article by Peter Broczko: "The Socialist Market; Microcomputers Compatible With the IBM PC"]

[Text] For a long time the IBM firm ignored the microcomputer market. Its modestly named PC, a high performance, professional microcomputer, appeared only at the end of 1981 in the United States and at the end of 1982 in Europe. Since then machines compatible with it have spread like mushrooms throughout the world. The Hungarian SZKI [Computer Technology Coordinating Institute, Hungarian Computer Research and Development Center] was the first to respond in the socialist countries and barely 6 months after the European debut of the IBM PC it showed, at the 1983 Budapest International Fair, the Proper-16A, its machine functionally equivalent to the IBM PC. After this a quiet of precisely one year followed in the manufacture of the socialist countries, and then in the 20 months following they introduced 37 (!) various new models compatible with the IBM PC. The table contains the times of their appearance.

There are very many models in Bulgaria compatible with the IBM PC. This is explained by the fact that computer technology development takes place along two lines. One is the Computer Technology and Robotics Institute of the Bulgarian Academy of Sciences, which has traditional manufacturing links with the computer factory in Pravec. Accordingly they handed over manufacture of the IBM PC, developed under the name IMKO 4, and the same thing appeared there under the name Pravec 16. At the same time another department in this robotics institute deals with computer control of heavy current equipment. This department developed a computer group corresponding to the IBM PC for its own purposes--independent of its Bulgarian environment. These are the MIC 16A and its variants.

The other line is the IZOT Association which develops independently of the Academy; it developed a three machine microcomputer family. The smallest member is the IZOT 1031, an 8 bit, Z80 based machine using the CP/M operating system. The IZOT 1036, compatible with the IBM PC, is in the middle position regarding performance and the IZOT 1037 corresponds to the IBM PC/XT.



# Socialist Made Microcomputers Compatible With the IBM PC

Country	Year of Appearance				Number of Models
	1983	1984	1985	1986 (Apr)	
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Bulgaria		IMKO 4 IZOT 1036 IZOT 1037 MIC 16A MIC 16W MIC 16A portable Pravec 16	ES 1832 Intelext Pravec 16 MN Pravec 16 C	Super 11	12
Czechosl.			SMEP PP 06		1
Poland			ELWRO-800 Complex XT CS-88 PC EMIX-86 IMP 86 Mevax 6600 Quasar PC Star PC XT		8
Hungary	Proper 16 A	Proper-16W VT-16	MXT Profi PC MAT East Star Microcontroll 86 Varyter-XT Super XT	Controll AT	11
GDR			A 7100	K 8918	2
Romania					--
Sov. Union		Iskra 250		Iskra 502 Iskra 1030 Iskra 1130 SM 1840	5
China		Great Wall 100			1
Cuba		LTEL/PC LTEL/ZM	LTEL/18 LTEL/20 LTEL/PC		5
Number of models	1	13	24	7	45

A Bulgarian computer which received the designation ES 1832 passed the tests last year. An interesting feature is that for the most part it is made only of parts manufactured in socialist countries.

The Intelect, compatible with the IBM PC/XT, is made in Bulgaria in a manufacturing cooperation, probably from Far East import.

The Plovdiv fair last fall showed that the development of devices compatible with the IBM PC is the chief direction of effort in the area of professional applications in Bulgaria. This was proven by the fact that several dozen such machines were displayed in an entire pavilion, with the most varied software products on them.

A computer made in Czechoslovakia which is compatible with the IBM PC has not yet been introduced publicly. Only a very narrow professional circle was informed about preparation of the SMEP PP 06, at last year's fair in Brno. This is the newest member of the family developed at Zilina. The word "family" links these machines only in regard to their name and where they were developed, they are not compatible with one another. The SMEP PP 01 is a home computer; the 02 and 03 are based on an Intel 8080 and use the CP/M operating system; the 04 is LSI 11/03 compatible. Still they should be mentioned because they have selected this family for larger series manufacture.

In Poland 1985 was the year of the great turn. All the models compatible with the IBM PC appeared then. Of these only the ELWRO-800 is made in a state enterprise, in Wroclaw. This is the largest capacity member of the family. The 700 model is a home computer. The 600 is a professional machine based on an Intel 8080 using the CP/M operating system; it is a modernized 500, which was introduced in our country, and is compatible with it.

Except for the ELWRO-800 the other Polish models are made by small undertakings, at the so-called Polonia enterprises. These are small undertakings established jointly with Poles living abroad. The foreign partner provides the parts and technology needed for manufacture; the Polish side provides the experts and a market for the finished products. They also provide Winchester stores for the majority of their products.

Unambiguously Hungary has the pioneering role among the socialist countries in regard to machines compatible with the IBM PC. As we mentioned, the first such model, the Proper-16A, appeared in 1983, followed a year later by the Proper-16W and the VT-16.

After another year the small undertakings took this track also and entered the market with their products, partly their own developments and partly by completing semi-finished machines from Far East import. The Varyter-XT of the MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences] appeared at the end of the year; departing from tradition they quickly delivered 150 of them to Academy institutes.

In 1984-85 we could talk about a software market primarily in connection with the Commodore-64. Then, at the end of 1985, there was a strengthening of the software market for the IBM PC. By the spring of 1986 there was a very

significant supply of domestic software for these machines. Of these products the programs doing general purpose tasks are popular first of all, such things as database management, window techniques and serving local networks. At the same time there is already a supply of software products for various applications purposes.

The first IBM PC compatible machine in the GDR appeared only in the spring of 1985; this was shown this spring in a nicer exterior design. But since even this year the single machine shown was running only a simple business task--while thirty Z80 based CP/M operating system Robotron 1715's illustrated various applications around it--one can presume a certain backwardness. The explanation probably is that they put the emphasis on development of the Z8000 out of the 16 bit microprocessors. They succeeded in developing a functional equivalent of this, last year they already exhibited a prototype based on it, but in the meantime the world took a stand for the Intel 8088. It is rather difficult to shift when one has momentum in another direction. (This case is a bit reminiscent of the decision of the Bulgarians for the 8 bit Motorola 6800 at the end of the 1970's; only in the fall of last year did they switch from it to the Z80.)

The new IBM PC compatible machine of the GDR introduced this year, the K 8918, contains a so-called Cesar card used for graphics purposes. As its model number indicates this is an intelligent terminal which they connected to an A 6402, corresponding to a PDP-11/40. The graphics peripherals operating in the configuration--A/0 size plotter and digitizer--and the software running on the machine support machine industry and construction industry design work.

As of the spring of 1986 Romania had not yet shown a machine compatible with the IBM PC, which permits the conclusion that Romanian microcomputer manufacture, which was in the forefront among the socialist countries in 1982-83, has stagnated and is losing its significant position.

We have only heard reports of the Soviet Iskra 250--manufacture of which may finally be getting started--but not one Soviet machine compatible with the IBM PC has been shown at foreign exhibits. According to fair announcements series manufacture of new models which appeared this year began this year, so in the Soviet Union also the spread of the IBM PC track has begun.

According to one source the world famous firm of Wang, of Chinese origin, is assembling machines in China with contract work; according to another source IBM is doing the same thing. But it is a fact that machines exist because in 1984 in Bulgaria and this year in the GDR they exhibited the Great Wall 100.

In 1983 already Cuba was working intensively on development of its machine compatible with the IBM PC and it introduced the first two models, the portable LTEL/PC and the desktop LTEL/ZM in the fall of 1984 in Plovdiv. A year later, increasing the performance of these machines, they appeared with models compatible with the IBM PC/XT.

In order to use the extra performance of machines in this category one needs Winchester stores with large storage capacity and fast access time. These have reached socialist countries from the developed countries, for even our country

has only shown a prototype of a Winchester store. This is a 10 M byte store developed by the MOM [Hungarian Optical Works] series manufacture of which is expected to begin this year.

In the area of printers also one can speak of larger volume manufacture in the socialist countries only in regard to the cheaper matrix printers. In the larger capacity category--e.g., laser printers--Videoton introduced the first in the socialist countries last year; it is in the process of being put into production.

Throughout the world--and in the socialist countries also--microcomputers compatible with the IBM PC are made on two sorts of microelectronic element base. Originally they used the Intel 8088 quasi 16 bit microprocessor which, for the time being can be obtained only in the West. The majority of the microcomputers in this category made in the socialist countries contain this; Czechoslovakia has specialized for its manufacture. The start of series manufacture is planned for 1988 and they hope to produce 10,000 units in the first year. The planned price per unit is 1,060 crowns.

Two models, the Soviet Iskra 250 and the GDR A 7100, are made with the 16 bit Intel 8086 microprocessor; more precisely, they use the Soviet equivalent designated K1810N86. The Soviet Union is prepared to deliver this microprocessor so there is no obstacle to its wider use.

The Proper-16W which appeared in the spring of 1984 was the first socialist microcomputer compatible with the IBM PC/XT. This was followed in the fall of the same year by the IZOT 1037. Then, in 1985, an entire series of new models in this performance category appeared--the Bulgarian Intelect, the Polish Complex XT and Star PC XT, the Hungarian MXT, Super Xt and Varyter-XT and the Cuban I.TEL/18, LTEL/20 and LTEL/PC.

So far only our country produces machines with performance equivalent to the IBM PC/AT, and compatible with it--the MAT, the East Star, which carries its origin in its name, and the Controll AT which appeared this year.

Socialist made relatively light weight portables compatible with the IBM PC appeared around the fall of 1984--the portable version of the Bulgarian MIC 16A and the Cuban LTEL/PC. The third machine, so far the only "portable" machine compatible with the IBM PC/XT, is the LTEL PC. "Portable" must be put in quotes because these machines are suitable for being moved from place to place but grid power is needed to operate them.

Of the IBM PC compatibles being produced in the socialist countries the Proper-16A is, so far, being produced in the largest series; this year the number of units produced is expected to exceed a thousand. Thus far the VT-16, Varyter-XT and MXT have been produced in series smaller by one order of magnitude. For the time being one can speak only in the tens of the other models.

It follows from the manufacturing volume that for the time being one cannot speak of the export of these machines. The domestic machines will have such

prospects soonest, market preparation has begun, and the Proper-16 and VT-16 already appear at foreign fairs.

For the time being a software market for IBM PC compatible machines is beginning to develop only in three countries--Bulgaria, Poland and Hungary. (These three countries produce the most model types.) It is characteristic of the markets that for the time being they are developing on their own strength for their own needs and have foreign contacts only toward the West.

The most important event of 1985-86 on the market for microcomputers in our country was the drop in prices. No IBM PC compatible machine was exempt from this. The price of them actually fell to that of the 8 bit professional machines, and literally wiped them out--they can no longer be produced as much more cheaply as their performance is less.

In the other socialist countries, since there is still a shortage of IBM PC compatible machines, the price of them continues to be very high. It would be rational to export the domestic over supply to the CEMA countries.

Machines compatible with the IBM PC appeared in the socialist countries virtually as an explosion; the dynamic of the number of models in this category is without example thus far. In a way which can be compared only with the appearance of the ESZR [Uniform Computer Technology System] machines it is a unique phenomenon that within a short time they achieved virtual hegemony in their performance category, homogenizing the professional microcomputer market. Despite the appearance this year of the new IBM PC/RT family we can say that for a long time yet the machines compatible with the IBM PC may enjoy balanced demand in regard to both the hardware and software markets.

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## EAST EUROPE/COMPUTERS

### ADVANTAGES OF 32-BIT MACHINE

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 27

[Text] "In regard to efficiency the computers with 32 bit architecture represent a qualitative improvement compared to machines sold here," says Miklos Szojak of the KFKI [Central Physics Research Institute].

"The greatly increased addressable operating memory makes possible the fast running of highly complex, very large, interdependent programs."

In the opinion of Daniel Bardosi (of Instrument Technology) the 32 bit machines represent primarily a performance advance compared to the PC/XT, AT categories. They are at least an order of magnitude faster than the AT. Used as a multiple work station system the operating speed of the several terminals does not decrease even if the number of terminals connected to the system is increased significantly.

Gyorgy Beck (SZAMALK [Computer Technology Applications Enterprise]) notes that compared to presently used professional PC's and minicomputers one can use the 32 bit machines to create really serious, interactive, multiple computer data processing systems, exploiting the developed operating systems, the very rich data management software support and the network possibilities. This machine offers real hardware/software support to CAD/CAM applications--one should think here of speed, memory capacity and the ability to use special graphics software. We should add, only if these 32 bit machines are supplied with large capacity, fast and, especially, very reliable background stores as modern as the central units.

Miklos Szojak adds: "I would be very happy if I were to see more and more domestic users in the near future who exploited the abilities of these machines to the maximum."

At the spring Budapest International Fair we could convince ourselves of a large number of the technological and applications advantages and possibilities mentioned. But has there been proof of the statement of the vendors that the 32 bit computers offer an outstandingly good price/performance relationship which previously could not be achieved on the domestic market? It can justly be expected of the price of multiple work

station, 32 bit systems that the hardware cost projected per work station should be significantly less than the price of an independent professional PC.

The computer technology development of the past decade has produced a user base which today justly demands the appearance of these modern, large capacity machines and hopes for a continuing supply of reliable, good quality units in sufficient numbers from the manufacturers.

#### Domestic 32 Bit Computers

	TPA-11/540 -----	Mikrosztar-32 -----	MVX-32 -----
Vendor	KFKI	SZAMALK	Instrument Tech.
Operating memory (M bytes)	4-12	4-16	2-9
Operating system or systems	VMS compatible	Micro-VMS; UNIX compat.	MVX-VMS; UNIX compatible
Network possibility	DECnet compatible	Ethernet	Its own (MT-NET)
Number of work stations (max.)	10-15	33	21
Price* (millions forints)	8-10**	no data	9.7***

\* July 1986.

\*\* The guide price (4 M byte CPU, 1 x 80 M byte disk unit, 1 x magnetic tape unit, 1 x line printer, displays, power unit);

\*\*\* (4 M byte CPU, 71 M byte Winchester store, 90 M byte streamer drive, 4 line multiplexer).

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CSO: 2502/1

EAST EUROPE/COMPUTERS

VIDEOTON FACTORY OFFICIAL INTERVIEWED ON PLANS

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 30

[Interview with Janos Gantner, director of the Computer Technology Factory of the Videoton Electronics Enterprise, by J.A.V. The introductory comments below are followed by information taken from two graphs published with the article.]

[Text] Videoton was not liked in the 1970's because the computers made here were considered expensive compared to the products of other domestic manufacturers. Today what is suspicious is that the factory is offering its microcomputers "unmercifully" cheap. And it is said: "This is not the business of Videoton, it will give up computer manufacture." One hears a lot about the backwardness of the "country's biggest" too. Some cite with anxiety, others with malicious joy, those small cooperatives where they have manufactured 16 bit, even 16/32 bit, microcomputers while Videoton came out with an 8 bit TV computer and a PC compatible VT-16. Anyone can learn, concerning the Computer Technology Factory, formed 15 years ago, that thus far it has produced 50 billion forints worth of computer systems, printers and displays. Indeed, we can see from the steepness of the graphs that 5-6 years, instead of 15, will be enough for another 50 billion. But will the curve continue to rise? We talked with Janos Gantner (41), director of the Computer Technology Factory of the Videoton Electronics Enterprise, about questions affecting Videoton, and then, as always happens, we talked about everything from the general Hungarian economic situation to socialist democracy.

Development of Sales Receipts of the Videoton Computer Technology Factory (billions of forints): 1971, 0.1; 1972, 0.53; 1973, 0.89; 1974, 1.73; 1975, 2.31; 1976, 2.55; 1977, 2.87; 1978, 3.18; 1979, 3.6; 1980, 3.11; 1981, 3.51; 1982, 4.41; 1983, 5.0; 1984, 5.73; 1985, 6.36.

Ratio of Product Groups: Computer systems, 46.0 percent; Software and services, 10.3 percent; Printers, 18 percent; Displays, 14.0 percent; Other, 11.7 percent.

[Question] "They say" that Videoton will give up computer manufacture. If we were to ask you about this you would call it slander. So let us put it this way: Is it paying Videoton to manufacture computers?



[Answer] If I want to answer unambiguously then I would say, it has so far! Whether it will pay in the next 10 years... well, there are interrogatives in the answer too. The problems are interconnected with the general Hungarian economic situation. While sources are still increasingly restricted for us they are making informatics investments on the dollar accounting market with which we cannot keep up. Our competitiveness is deteriorating not only in the West; the situation is similar within CEMA. The socialist countries also have turned incomparably more to the development of electronics than we. In such a situation I myself can do nothing more than fix my eyes on the stressed informatics program and say, in economists' talk: Perhaps supplementary sources may be created and by exploiting them the relative deterioration of our competitive situation may be decreased.

[Question] Might we put it a little more crudely and say that this way Videoton puts the guiders of the ministry in check; that is, if they do not produce the supplementary sources then the wasting away of domestic computer manufacture falls on their heads?

[Answer] Videoton is not putting anybody in check, it is only trying to adjust to the economic circumstances. Similar questions come up at the beginning of every 5-year plan, and Videoton can attribute its stability to the fact that when the situation required it it was able to give up the manufacture of motors and switch to radios. Similar switches define its entire history. If it is not possible to compete on one track then one must get out of that field. This is not a question of tactics or strategy, it is a question of life and death. But lest my answer should suggest that the slander is true let me state that the Computer Technology Factory of Videoton is basing this year's 6.8 billion forint plan and its 5-10 year developmental strategy on the belief that the deterioration in the competitive situation can be stopped and that it is worth it for us to stay on this track.

[Question] In the development area Videoton speaks openly of a "following" strategy. That 5-10 years ahead, would that be the distance from us of the peak technology of the moment? Altogether, at what distance does Videoton follow the developments of the computer technology of the developed industrial countries?

[Answer] The question is rather poetic. I do not think you expect a numerical answer. But in this case permit me to give a "poetic" answer: Our goal is to follow those we follow at the distance by which the needs of the Hungarian market follow the market needs of those countries.

[Question] What sort of needs of the Hungarian market are you thinking of? The real ones deriving from what is needed, needs not yet recognized, or those created by fashion? Because today a machine room boss who would get himself a Pierre Cardin shirt will choose at least an AT category machine, if he is satisfied with 16 bits!

[Answer] One can categorize the needs of the Hungarian market in this way because what exists in Hungary is not a real market but only a simulated one. The various market components (manufacturers, importers, tourists) operate under entirely different conditions, and the natural consequence of this is a

few annoying or laughable "strategic" strokes. Let us not talk now about the hundred types of microcomputers developed here or about our import policy, which I consider excessively liberal despite all the contrary gossip. (I mention it not as an example to be followed but simply as a fact that Czechoslovakia, let us say, has a much more uniform computer inventory, thanks to the greater coordination of import and development.)

The question hides another problem connected with market needs: How are the potential users to measure their needs? With the spread of microcomputers very many new users are contracting those childhood diseases which were already well known when the large and medium computers were proliferating. They did not cause an epidemic then because only a few hundred of the managing organizations could "get it." So--to answer your question--we trust that sooner or later everyone will outgrow the childhood diseases and real market needs will be formulated, and we are trying to accomodate to these now, even before they are enunciated.

[Question] How is this accomodation expressed in the product structure? If I may attach yet another scandal to this question, let me say that allegedly Videoton wants to abandon manufacture of the VT-16 and switch to assembling PC's. Would this be an example of accomodation, or is the rumor not true?

[Answer] I would begin by saying that we think of the chief characteristic of the accomodation not in terms of machine models but rather in terms of machine categories. The market--in my opinion--will require three performance categories. Of these the hobby computers can actually be regarded as consumer goods. Two size categories should be distinguished on the market for investment goods--one of the computer systems serves to solve the applications tasks of one user professional; the other can satisfy the needs of a number of users at once, it is a high performance system also suitable for complex graphics tasks. At present Videoton offers a computer in each performance class--the TV-Computer, the VT-16 and the VT-32. Each performance category, of course, has a longer life than each machine model, so--calculating with a development cycle of, let us say, 2 years--new computers are constantly appearing. In the given performance class the assembled PC could be an alternative to the VT-16 just as the multiple work station PC category could be for the VT-16/III introduced at the spring BNV [Budapest International Fair].

[Question] In regard to needs it was said that not every market need is a real one. Now, permit me to ask, What is the situation with supply? Let us stay at the BNV, let us say with the VT-32. If my memory does not deceive me this is the third time this machine has figured at a special fair for investment goods, but for the past 2 years there has not been a supply of them.

[Answer] There are fairs to which one must take what one wants to sell tomorrow and there are exhibits at which one must demonstrate participation in research and development programs. At the BNV we always show, at the same time, our products and our developmental achievements.

The link between developmental achievement and product is broken not only by the much mentioned meanderings of the innovation path but also by such prosaic

questions as whether it will pay to manufacture this machine. Such questions as where and now the parts can be obtained, where and how one can get the software, where and how it can be sold. As a consequence of the already mentioned market segmentation one can imagine that what is good business for a small cooperative could be a loss for us. On the basis of all this I can say concerning the VT-32 that last year and the year before it was at the BNV for the sake of the completeness of the picture given of us; this year it was present as a product.

[Question] This means that the family Videoton is advertising is complete. The question is, How much harmony is there within the family? Do the family members understand one another? To what extent are the TVC, the VT-16 and the VT-32 a family?

[Answer] I might simply parry the question by saying that this is one family because Videoton manufactures every member of it. Everyone regards the IBM PC as a member of the IBM family, but if we look at it it was created virtually independently of "Big Blue." It is characteristic of the 1980's that the compatibility trends were modified, and a new order has not yet developed.

In this "lack of trends" Videoton has tried to ensure sufficiently profound user compatibility among its microcomputers in various performance categories. For example, the COBOL developmental system, COBLAB, patented by Videoton will run on every member of the family; indeed, with its aid one can transfer to any of the new models programs written for the earlier microcomputer manufactured in large series by Videoton (the VT-20). Another user oriented compatibility is the same disk format. Data recorded on a floppy disk on a TVC can be accepted by the VT-16 in 8 bit operating mode without further ado, and we are already preparing a VT-DOS operating system for the TVC which can understand the 16 bit branch of the VT-16.

[Question] After talking about the product family let us say a few words about the "large family" of the workers. This year--for the first time in the history of Videoton according to my understanding--there was a brochure about the products and last year's results of the Computer Technology Factory. The brochure presents the fundamental goals of the Computer Technology Factory divided into points; but this is not the surprising thing, rather it is the listing of nearly 4,000 workers. On the inside cover the leadership of the factory thanks everyone by name for their cooperation and responsible work done to achieve the results. The matter is eerily similar to one of my experiences this year; at the European editors conference of Computerworld Communications the American president of the firm felt the same necessity to greet his European colleagues by name during his speech. Is this another example of the "following strategy"?

[Answer] Maybe, but in this case it is not certain that we are the "followers." I am surprised to see on my Western trips how they show off as a new discovery the posters of praise, the brigade competitions and quality circles recalling the golden age of the Stakhanovite movement. They are working on deepening the ownership attitude, on bringing workers into the leadership and on expanding democracy with such elan as if the thirteenth

congress of the MSZMP had not dealt with these questions but rather, if I may say so, the Republican presidential nominating convention had.

There was a time when we took these slogans seriously, but at that time the words were in an essential contradiction with the incentives system coupled with them. This does not mean that the fault was in the slogans or, if you like, in the basic ideals. If nothing more these basic ideals seem to be justified by the fact that profit oriented enterprises also feel a need for greater moral recognition of workers, for strengthening the ownership attitude. We are trying to approach the old ideal by little steps, and it is a special joy that the policy of recent years is helping us in this.

At this stage of the technical culture we simply could not preserve our competitiveness without the faith and commitment of the workers. I know that this may sound like the demagogy of the 1950's, it may appear like imitating the American style, but all this brochure cover means is that the workers responsible for the factory achievements have given their names to these achievements. I suspect that you will sign your article, at least with initials. Am I right?

[The article is signed with initials, J.A.V., standing, according to the masthead, for one of the six editors, Janos Andor Vertes.]

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## EAST EUROPE/COMPUTERS

### HISTORY, ROLE OF M-PROLOG IN AI

Budapest COMPUTERWORLD-SZAMITASTECHNIKA in Hungarian No 1, 17 Sep 86 p 32

[Unsigned note: "The MPROLOG Language"]

[Text] MPROLOG is a dialect of the PROLOG language which is an extension of DEC-10 PROLOG, regarded as the world standard, with a more convenient syntax, modularity, a rich built-in definition set, graphics and tools supporting simulation. A powerful program development system has been built around the MPROLOG language.

The logic based PROLOG language was given definition in 1972 (Colmerauer); the first domestic implementation was in 1975 at the NIMIGUSZI [Industrial Economics and Systems Analysis Institute of the Ministry of Heavy Industry] (Szeredi); the MPROLOG language and system were developed in 1982 at the SZKI [Computer Technology Coordination Institute, Hungarian Computer Research and Development Center].

In the beginning the MPROLOG system operated on computers and operating systems which were available in Hungary on a very limited basis (IBM 370 compatible machines, VM/CMS and MVS/TSO operating systems; VAX 11 computer family, VMS and UNIX operating systems; Siemens machines, BS2000 operating system; Motorola 68000 based machines, UNIX type operating systems; and Apple Macintosh). Solutions using artificial intelligence are in general very resource (time and space) intensive, and with a few exceptions the generally used computers were not suitable for such purposes.

In the past 1-2 years there has been a very swift spread of IBM PC/XT/AT compatible machines, which offer in the PC category the performance of the medium computers of a few years ago. Thus with the transfer of MPROLOG to the IBM PC/XT/AT and compatible computers running under PC DOS the way has opened for broader applications.

[Article by A. K.: "MPROLOG on a Proper"]

[Text] Artificial intelligence (AI) research and use of its tools play an ever greater role at the SZKI. The modular MPROLOG system, which is a realization of the PROLOG language aimed at expressly practical tasks, is at present primarily an export product. Now it can be run on the Proper-16 computers,

producing a basis for creating expert systems in this machine category. Most of the some twenty domestic users use versions of the PC, but within the framework of various cooperations MPROLOG also runs on the large computers of the larger domestic computer technology firms.

The Proper-16 has been supplied with a hardware/software supplement called the MPROLOG processor which involves an extra cost not exceeding 50 percent of the price of the professional personal computer. This makes possible efficient AI applications. Next year the MPROLOG processor will be available for other domestic IBM PC compatible machines. These will provide services corresponding to AI work stations one price category more expensive.

Balint Domolki, scientific director of the SZKI, says, "Applications projects where we are trying to develop PROLOG based expert systems are under way at various stages of completion.

"Here we must find primarily an expert partner who understands not only the collection of data in his field, making it available in a form which suits the machine and how to perform computations but also the need to make certain logical conclusions and--put in many quotation marks--how to 'think'. Cooperation has developed primarily in medical applications; here we can find in concentrated form the expertise needed to develop such systems. The development of expert systems is taking place in various domestic hospitals, for example in the Hospital Clinic on Sandor Peterfy Street in Budapest. The situation is similar in the area of pharmacology; we developed, jointly with the National Pharmacological Institute, a system studying the mutual effects of medicines. The first expert systems can be expected to appear in the near future in the machine industry and the construction industry."

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EAST EUROPE/CHEMICALS, PHARMACEUTICALS

GDR POLYURETHANE COMBINE DIRECTOR DISCUSSES APPLICATIONS

East Berlin URANIA in German No 8, 1986 pp 12-17

[Text] VEB Synthesis Factory Schwarzheide--SYS Combine

The combine was formed in 1979 from enterprises that have a long tradition in their area of expertise. Today the following plants constitute the combine:

VEB Synthesis Factory, Schwarzheide, headquarters of the SYS combine,  
VEB Explosives Factory, Schoenebeck  
VEB Foam Chemistry, Burkhardtsdorf  
VEB Pyrotechnics, Silberhuetten  
VEB Explosives Factory, Gnaschwitz

The more than 12,000 employees, among them more than 1,800 university and technical school graduates, are involved in the manufacture of a large number of products. The combine manufactures herbicides, explosives for industry and mining, ammunition for hunting and sports and various pyrotechnic products, in addition to polyurethanes.

The headquarters by itself is the supplier for more than 600 user plants in our republic. This includes both PUR raw materials and, at the present time, many more than 100 SYSpur systems. Special mention should be made of the production at headquarters of standardized parts, semifinished products and finished products made from polyurethane elastomers for many areas of our economy.

A cooperative system of labor sharing exists between the USSR and the GDR both for the development and the testing of new polyurethane raw materials. From this friendly cooperation have resulted more than 200 copyrights for the USSR, more than 150 patents for the GDR and almost 100 joint inventions.

On the basis of its successful work over a period of many years, the VEB Synthesis Factory, Schwarzheide was awarded the Karl Marx Order in 1984. Additional honors and distinctions are, for instance, the Enterprise with Work of Outstanding Quality, Enterprise with Exemplary Water Management, the Honor Banner of the SED Central Committee and the Flag of the Council of Ministers and the Board of the FDGB, which the enterprise received to honor the 11th Party Congress in recognition of its outstanding performance in socialist competition.

As the sole manufacturer of polyurethanes, with their multiple applications, and known and sought after both on international markets and among many users and consumers in our country under the trademark SYS-PUR, the SYS combine bears a heavy responsibility for supplying our economy with raw materials and semi materials which can be processed into products with high quality and efficiency, using modern technologies. Director general Dr Hans Joachim Jeschke explained to us in a conversation how the combine workers are better able to meet this responsibility:

It is difficult to find just one area of our daily lives in which the adaptable polyurethanes from the VEB Synthesis Factory, Schwarzheide do not play some part. We lie or sit comfortably on cushioned furniture that is filled with PUR soft foam, we walk far and long on shoe soles made of PUR elastomers. Every refrigerator manufactured in this country is efficiently insulated with PUR rigid foam. We find these modern plastics everywhere--as binders in magnetic recording materials, as foam in surf boards or plastic skis, as a coating for textiles or as a universal adhesive. They are even finding an application as a synthetic skin substitute, which is of life-sustaining importance with burn cases, for example.

Can polyurethanes be described as "custom plastics"? To some extent, yes, the director general agrees. In many cases, for instance, the combine supplies the premixed components to the processing industry, where the plastic material as such is created when the final product is manufactured. As an example of how it was possible to raise the quality and efficiency of the products substantially by applying modern technologies, Dr Jeschke cites the above-mentioned refrigerators: Whereas just a few decades ago carmelith wool was stuffed between the walls for insulation purposes, the use of preformed sheets of polystyrol foam represented a considerable advance. The breakthrough to fully automated assembly line manufacture of complete refrigerator outer shells became possible when the change was made to the introduction of the two PUR base components between the inner and outer skins. The chemical reaction, during which the products expands and hardens, now takes place there, filling every corner of the available space.

This principle of using polyurethane has found multiple applications in the most diverse branches of industry--in railroad car and ship building and in construction. If one considers that polyurethane foam has an insulation rating up to 10 times higher than that of masonry, it is simple to calculate that a considerable intensification effect is achieved as the result of the high degree of refinement of the materials used. High work productivity, together with the maximum conservation of materials and energy, are the economic results which benefit all of us.

In this context, the question arises concerning research into, and the development and introduction of new materials which contribute to increasing productivity in other areas of the economy and thereby exert some influence on pushing intensification ahead.

The director general mentions principally the polyurethane elastomers, a new class of materials, which, if used optimally, can help to fulfil this requirement of our economic strategy.



SYSpur-elast , a modern PUR material with a high utility value and multiple possible applications, is taking over increasingly in all branches of industry. Because of its durability, which is several times greater, its freedom from maintenance and its functional stability, this plastic material is replacing rubber and steel and other materials, such as polypropylenes, polyethylenes and polyamid, in vehicle manufacture, machine construction, the textile industry, the construction trade and the ore refining and aggregate industries. Without exception, significant economic advantages have been identified in all areas.

For example, sieve facings made from SYSpur-elast EG in the brown coal, the gravel and aggregate industries produce convincing benefits. The useful life of the sieves in briquet factories, for instance, exceeds that of steel sieves by 10 to 20 times.

By using SYSpur-elast in flotation installations in the potash and ore refining industries, their availability is substantially increased and service life is three times longer.

SYSpur-elast clutches are finding an ever broadening sphere of applications. As a result of its good mechanical rigidity and chemical integrity, particularly in contact with oil and grease, a considerable advantage emerges compared to rubber or leather pads. Clutches of different construction (e.g. dog clutches, roller thrust clutches, ring gear clutches) in large measure determine the performance, the utility value and the reliability of machines, installations and vehicles.

Impellers for different types of pumps for fluid media with solid constituents are exposed to great frictional loads. Until now the impellers have been made from cast steel alloys. SYSpur-elast is far superior to cast steel in its wear behavior. Their hydraulic characteristics are identical.

In addition to the great number of semifinished equipment products and molded parts, thin molded soles of SYpur-elast are manufactured at the SYS combine for the shoe industry. They complement the range of soles made of PVC, hard cell, thermoplastic rubber and PUR integral foam, which has been in use for a long time. These soles have an attractive exterior with a high formability accuracy and they excel because of their outstanding mechanical characteristics, wear resistance and permanent flexible integrity. The requirements for the state standards for the Q quality label for physical-mechanical properties are met.

These are only a few examples of the breadth of applications and utility of the new materials from Schwarzheide. They are now yielding excellent results in more than 600 enterprises in all branches of GDR industry and they are contributing to the manufacture of new products using modern technologies.

Just as the SYS combine is making an indispensable contribution to the intensification of production in other branches of industry with its highly refined products, it is also meeting the requirements for high quality and efficiency in its own area. As director general Dr Jeschke explains, waste-free technologies are playing an expanding role. "Previously we had a distillation

residue from our two isocyanate plants of about 1,500 to 1,800 tons annually, which had to be incinerated in the rotary cylindrical furnace. We have now found a way of processing the residue from the distillation process in one of the isocyanate installations, using the appropriate additives, so that it can be removed in the form of system components that meet our standards completely. From the residue from the other installation we are now producing a polyol raw material, that is, another polyurethane component, which also goes 100 percent into our manufacturing process. One can say that our isocyanate production is absolutely waste free."

In Schwarzheide there are hardly any waste products in the other installations and process steps. Wherever they occur, they are reused for the most part and are returned to the production cycle. The combine also offers a convincing example that optimal exploitation and the highest refinement of the raw materials employed not only bring an economic benefit but are also the best contribution to effective protection of the environment. Dr Jeschke points out, not without pride, that all the waste water from the giant chemical enterprise leaves the plant biologically purified. Customers from abroad are now showing an interest in the progressive procedures developed in Schwarzheide for effective environmental protection, as shown in the schematic on page 14.

The distinction of "exemplary water management combine" is deserved recognition. It is understood, as Dr Jeschke stresses, as an obligation to combine every intensification of production with the intensification of the installations for environmental protection. The combine has long been model of energy efficient management. It requires no further comment if we say that in the last 5-year plan the combine was able to increase production by 44 percent with practically the same use of primary energy sources. This can be attributed primarily to the fact that ways are being found of using most of the resulting secondary energy through appropriate research and development.

Dr Jeschke stresses emphatically that such achievements can only come about as a result of the dedicated, creative work of the approximately 6,000 employees at the Schwarzheide headquarters. "We direct the collectives toward the broad application of key technologies, especially the use of modern computer techniques in all areas of production, administration and sales. We generate the necessary conditions not only by making the appropriate equipment and institutions available, but principally through a dedicated program for the qualification and continued training of our workers. A precise knowledge of the tasks and problems to be resolved enables our colleagues to contribute their thoughts to the needed decisions and to dedicate their energies to what is new. Anyone who feels that new technology results in substantial economic benefits on the one hand and simultaneously contributes to an improvement in working and living conditions will gladly confront the new challenges."

The director general says that it is never too early to shape this type of knowledge and attitude and he points to the great value that is placed in Schwarzheide on training a highly qualified second generation of skilled workers. We were able to find convincing proof in the enterprise's vocational school W. Lienack, which happened to be celebrating its 40th anniversary during

our visit. About 200 apprentices are trained here each year. Among the opportunities available to them is the chance to familiarize themselves with the basics of key modern technologies on a real life" ZIM 60 industrial robot and to acquire some skills in controlling and programming it. A computer room will soon be added.

Important innovations in production grow on this type of solid foundation, for instance, an automated packing line for both herbicide and polyurethane products. Young people from the enterprise developed a drum sealing robot, which automatically tightens the screw plugs in the drums. This is an exemplary solution for the entire industry of the GDR and which can certainly find a broad application, especially since it represents a major contribution to the elimination of heavy physical labor. About 300,000 drums, with a content of 200 liters, have to be filled and sealed in Schwarzheide annually. Patents have already been granted.

This is an example of the diverse efforts undertaken by the chemical workers from Schwarzheide to tap new sources in order to improve the efficiency and quality of their production. They are seeking this improvement by selectively utilizing the results of scientific research and technological development and consistently exploiting their own capabilities in constructing the means of rationalization--which has incidentally increased more than 4 and 1/2 fold in the last 5 years.

Almost 50 percent of all the products from the SYS combine bear the quality label Q--the standard for the highest quality. In this way too, the workers and engineers at the synthesis factory are helping to meet their growing responsibility in supplying our industry with high-quality raw materials and materials from which modern technologies create products that bring pleasure to all of use and bolster the export strength of our republic. The achievements of the Schwarzheide chemical workers lend weight to the words of the director general when he voices the conviction that the SYS combine is and will remain a respected partner in our economy.

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EAST EUROPE/FACTORY AUTOMATION

MACHINE BUILDING AUTOMATION FEATURED AT LEIPZIG FAIR

Prague TECHNICKY TYDENIK in Czech No 27, 1 Jul 86 p 9

[Article by Jan Hruby, Leipzig: "Flexible Production Systems"]

[Text] Both Leipzig trade fairs have a broad spectrum; in the spring and fall they present an opportunity to survey the development of production in all branches of the national economy of the German Democratic Republic. In recent years it was found useful to emphasize certain branches or fields and to direct the attention of experts and other visitors at the fair to those fields.

Congress IKM 86

Held in March this spring, the Leipzig trade fair featured automation and intensification in the machine building industry. Shortly before the fair opened, the IKM 86 international congress on this theme was held in Karl-Marx-Stadt. Sixty contributions by leading experts from the Soviet Union, Japan, USA and 9 other industrially developed European countries were presented. Experts from the German Democratic Republic gave 20 lectures in which they acquainted participants in the congress with the current technology of machining and forming tools which constitute the export program of the German Democratic Republic. Some of the presentations dealt with future prospects.

The focus of further development lies in the production of computerized machining centers, flexible manufacturing systems and flexible production lines, primarily for repeated or odd lot production. This concept is based on analysis of labor intensiveness in various branches of the national economy of the German Democratic Republic and other socialist countries, and the technological levels already attained in operations in mass production and with better work organization where, for obvious reasons, computerization was introduced earlier, such as in manufacture of bearings, electric motors, etc.

The concept has two main directions--computerization of machining and forming and computerization of assembly lines. The plan is divided into individual targets: diagnosis of the production system, gauging of tools, interoperational control, handling, transportation and warehousing, and assembly parts and subassemblies. The control system interfaced with management information systems and a production planning. Then the individual tasks merge. Machine tools are and probably will remain the most expensive products of the machine building industry. For this reason manufacturers of machining and

forming equipment are reexamining their efficiency in order to create favorable economic conditions for computerizing production at the lower organizational levels. The solution is international cooperation, thorough standardization and mass production of parts and subassemblies which could be used to form needed production and assembly units and systems.

At the spring Leipzig fair we interviewed Doctor of Engineering Petr Ulrich, director of the Fritz Heckert Kombinat Machine Tool Research Institute in Karl-Marx-Stadt. Among other things, he said that the current obstacles to more rapid intensification of cooperation among producers of machining and forming tools in CEMA countries are the disparate approaches to the problem and differing concepts; each country defines computerization differently. This situation does not help attempts at a unified solution of topical problems. At present each socialist country is developing its own system. These include some unique projects which are attracting international attention, but it is a fact that such a lack of unity lessens the productivity of the CEMA scientific and production base of engineering.

#### Hall No 20

The exhibits of machining and forming tools at the technology exhibition grounds were tied to the IKM 86 Congress. The foreign trade organization of the German Democratic republic, WMW Export-Import, Berlin, mounted an extensive exhibit in Hall No 20. Under the central theme of "Flexible Computerization a New Dimension in Manufacturing" one could see the results achieved by workers of manufacturing enterprises of the Fritz Heckert Machine Tool Kombinat from Karl-Marx-Stadt, 7th October Machine Tool Kombinat from Berlin, Tool and Handtool Kombinat Schmalkalden and Forming Tool Kombinat Herbert Warnke from Erfurt in cooperation with their own research and development base, laboratories and institutions of higher learning and the Academy of Sciences of the German Democratic Republic.

Among the dozens of exhibits, one that stood out was part of the flexible manufacturing system (FMS 1000) for automated machining of casings with sides of 400 to 1,000 mm and weight of up to 1,000 kg. The manufacturer states that the system is effective in production lots of 6,000 or more. It machines 30 different types of casings with a production time 70-90 percent shorter than earlier methods of machining. At the same time labor intensiveness was reduced by 70 percent. FMS 1000 consists of 4 horizontal machining centers of the type CW 1000 and 2 vertical CS 1000. Washing devices, cooling and measuring stations, and tool and measuring gauge magazines are included in the cycle. Handling of transfer pallets and tool and gauge magazines is done by a rail-guided robot and in-process storage is done by a shelving machine. Interface with the control computer is maintained through terminals linked to the enterprise management information system.

Another interesting feature was a line for manufacturing welded tin cans up to 105 mm in diameter. The main parts [of the system] are the coiling and welding machines KEAZHS 100/40 and the automated paint machine KEZLT 100. These are connected to single-purpose machines which cut the tube into semi-

finished products 40 to 140 mm long, followed by banding of edges and beading of bottoms. The output of the line can be 300 or 600 items per minute, depending on the type.

Among the machining centers the unit FC 400 K/2.5 attracted attention; it was advertised as a new foundation stone for building flexible systems for making small casing parts. It has a magazine for 40 to 50 tools and a rotary clamping table. The automatic changing of the machined parts is done by special clamping fixtures controlled by a programmable CNC 600-3 machine, which is compatible with higher level control system. It is a compact machining center with advanced lubricating and cooling system of the main spindle. It is delivered with either an opto-electronic or contact control of tool wear.

Another top exhibit was the CNC H 646 microprocessor operated horizontal multi-spindle turret machining center BWMRS 4X630X630 for medium and large scale production and for construction of flexible manufacturing lines for the automobile industry. Entirely new is the arrangement of 4 multi-spindle drilling heads on a starshaped bracket with a vertical axis of rotation. Several engineering options are available: drilling, threat cutting, countersinking and reaming. Each of the drill heads is provided with control of the condition of the tool and a quick clamping device in order to shorten idle time while exchanging heads with damaged tools.

The change-over from using individual machines to production systems with a continuous flow of materials could be observed by looking at transportation and handling equipment. On exhibit was the induction controlled transporter LTR 1000 with a loading capacity of 1,000 kg for horizontal transfer in flexible systems; its platform can load mechanized pallets sideways and lift them to the level of the clamping tables in machining centers. The transporter is connected on-line to the central system.

#### Controls Are Set up During Construction

In the German Democratic Republic work is being done in parallel on developing computerized systems for manufacturing flat, rotary and casing components. Research is being done on pertinent control system. Information was available in the booth shared by manufacturers of machining and forming tools of the Kombinat Robotron, the Institute of Technology in Karl-Marx-Stadt, and the Academy of Sciences of the German Democratic Republic, which was located in the midst of the machinery in Hall No 20.

The booth was a window to the year 2000. The assumption is that at the turn of the millenium, advanced systems of the CAD/CAM type and related computer technology will be commonly available to link construction and technology to the production in the flexible manufacturing systems, as regards planning, organization and control of manufacturing and assembly. The goal is to create, during the course of 3 Five-Year Plans, conditions for high economic efficiency of computerized production processes.

According to Eng. Martin Gerloff, department chief of computer technology at the Fritz Heckert Machine Tool Research Institute in Karl-Marx-Stadt, much of the work to be done is in the area of normalization, standardization, and preparations for computerized construction, so that programs for production centers for control of machinery centers be created concurrently with production planning. Technical data also serve the creation of organizational programs, planning the mix of production batches, consumption of materials and tools, and the capacity scheduling of individual machines in the computerized production system.

It is an exacting and still uncommon work full of risks. Nevertheless, the first results are an occasion for self-congratulation. Work on the set of so-called rotation parts will be completed by the end of this year. At the same time, much more complicated work is being done on a set of prismatic parts. However, the problem-solving team intends to finish the stage - the most frequently used casings - by the end of 1987.

Producers of machine tools, controls, and computers are cooperating with the basic research personnel on the stated goals. At present, the basis of technology for solving problems is the CAD/CAM worksite Robotron A 6454 with a control computer K 1630. Its main part was exhibited in a demonstration program in Hall No 20.

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EAST EUROPE/LASERS, SENSORS, AND OPTICS

LASER RESEARCH, DEVELOPMENT IN HUNGARY

Budapest MAGYAR NEMZET in Hungarian 14 Jul 86 p 6

[Article and interview with Norbert Kroo by 'buza': "International Novelty in Blue, Cavity-Cathode Lasers, Lasers or the Palette"]

[Excerpts] The academic, Norbert Kroo, director of the Solid State Physics Institute of the Central Research Institute of Physics, spent a day in Graz as an invited lecturer at the Technova Exhibition. At this event, staged at regular intervals, our Western neighbors introduce the latest technical and technological achievements from all over the world, as well as the newest theories advanced and perfected engineering designs. It would not have been bad at all if our country's offering had not consisted merely in Norbert Kroo's eagerly awaited report on Hungarian laser research, if the crowd of international--and Hungarian!--experts attending had had an opportunity to actually see something of which we are justly proud, which we might even be able to market. But to organize something like that is definitely not a scientist's job.

Tricks and Secrets

[Question] Naturally, we continue to talk about lasers. That is how we come to mention the exhibition and Hungary's chances in general. Even though we spend deplorably little on this branch of research, in proportion to the results achieved, in some areas we are internationally among the front runners. Simply because we got in at the beginning with the kind of basic research which enabled our scientific workshops to react instantaneously to new trends in the end. Hungary was ready with its laser just two years after the birth of the world's first laser. And there are some areas in this discipline in which we were or are number one in the world. How far ahead are we? That is what we want to discuss.

[Answer] The world has always taken a keen interest in Hungarian laser research. Professor Janossy's earlier basic research in the field of optics and a number of new apparatuses with a record number of parameters would indicate that there is good reason for such attention. We mentioned earlier that we do manage to keep abreast of the international arena and that in some areas we are actually the front runners. What are the latest achievements emerging from Hungary's laser research workshops?



They are, indeed, workshops because, fortunately, it is not only at the Central Research Institute of Physics where we are engaged in this type of work. There is healthy and friendly competition among groups of experts and, in contradistinction to many other fields of endeavor, we have always been able to agree as to who is to work on what, so as to improve rather than spoil our chances and those of others. We cooperate and, at the same time, compete. But only in the sense of who will come up with the greatest number of good and usable ideas. We have come up with two such ideas recently. First of all, we are ready with our mini-laser, which can boast of world record parameters, putting it in the category of a marketable product. Unfortunately, we have been unable to find a Hungarian manufacturer. So we sold the license abroad, reserving for ourselves, of course, a percentage in future profits. This apparatus belongs in the laser group which utilizes the focused output of light, for example, in cataract operations. If you care to visualize such a solid laser, you must think of the solid as acting more or less like a coat hanger holding the coat. The "coat" is the aggregate of those impure ions in which the laser effect is created. They may, e.g., be neodymium ions. We must somehow fix these in space and for that we need a "hanger". Thus we build the system into some sort of crystal.

It is important that the crystal be very transparent and that it permit the inclusion of impurities. Such a crystal is the yttrium-aluminum-garnet, i.e. YAG. This is an extremely costly material. Our cooperating partners, the Prohorov Institute of Moscow, recently developed a special phosphate glass. It turned out to be a perfectly suitable substitute for YAG. Moreover, it can absorb the neodymium atoms in greater concentration than the crystal, which means it is capable of greater output than the latter. This is the heart of our new mini-laser which weighs barely 4 kilos, so that it fits easily in a briefcase, and it can perform almost as well as the YAG lasers costing ten times as much. Of course it has its uses in areas other than surgery as well. It can be used for spot welding and perforation--it is an excellent micro-electronic machining tool and may also be used in cosmetics, e.g. in tattoo removal.

#### More Cheaply, More Easily

[Question] Several weeks ago at a press conference organized by the Central Research Institute of Physics, I had an opportunity to take a close look at your blue laser in operation. I believe this gas laser is your other pride and joy.

[Answer] The most widely known helium-neon gas laser emits red light. In measuring technology it would be more advantageous to use an apparatus emitting light on one of the blue waves of the spectrum. The fact is that the shorter the wave length of the light emitted, the more accurate the measuring instrument which, in the final analysis, uses its own wave length as the base unit. An instrument such as this is already in existence, it is the argon-ion laser, which is, however, exceedingly costly. The reason it is so expensive is that for a large energy source of 30 or 40 A is needed for its energizing. Moreover, glass cannot withstand such high energization, so that the discharge space must be encased in beryllium oxide ceramic, and although the latter, is also costly and requires complicated technologies, its useful life is not more than several thousand hours. The aim of our research, therefore, was to come up with a blue laser for which a lesser energy

source would suffice. We hit on the idea that if we reworked the cathode, we could arrive at a suitable point of departure. That is how we developed our cathode cavity instrument. The laser effect is generated in a gas mixture of helium and krypton, on a beautiful blue wave length of the krypton ion, under the influence of the energization taking place inside the cathode cavity. The technology is simple, since we need considerably less energy, i.e. a less costly supply unit for energization than the argon laser. We were the first ones in the world to build a blue laser, but I cannot claim that it is completed. We are working on extending the life of the cathode. The disadvantage of the new arrangement is that the cathode is exposed to intensive effects and disintegrates after a few hundred hours of use. We must experiment with different materials, and in that endeavor we would welcome the cooperation of a company with the technology to produce such metallurgical materials at its disposal. Unfortunately, so far we have not found such a partner.

[Question] Frequent mention has been made over the last few years of the importance of basic scientific research. And also the fact that it is of crucial importance whether or not we can succeed in motivating our enterprises to utilize the scientific advances. You, who were present at the cradle of laser research, and to this day are the top expert in the field, might wish to express an opinion regarding these problems.

[Answer] We are engaged in basic research which yields readily utilizable results, not seldom and by accident, but continually and as a direct consequence of the nature of the subject. It should follow that we should receive all the support we need and that we should be able to translate our ideas successfully into practice. Unfortunately, that is not the case at all. I can only conclude that what is lacking in our country is a willingness to take chances. And we are short of incentives which might convince entrepreneurs and industry that it is worth trying their hands at something new. Let me come back to the first few sentences of our conversation. All we did in Graz was to deliver a lecture. We were unable to hand out even a catalog with photographs to those interested, so that they could at least visualize the instrument, and what we meant when we proudly mentioned international excellence in our report.

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EAST EUROPE/LASERS, SENSORS, AND OPTICS

HOLLOW CATHODE DISCHARGES USED FOR GAS, METAL VAPOR LASERS

Budapest MAGYAR FIZIKAI FOLYOIRAT in Hungarian No 1, 1986 pp 1-55

[Article by Karoly Rozsa, Solid Body Physics Research Institute, Central Physics Research Institute, Hungarian Academy of Sciences: "Hollow Cathode Discharges Used for Gas and Metal Vapor Lasers." Candidate's dissertation; received 1 February 1984.]

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Introduction

The first gas laser (1961) radiated infrared light with an output around a milliwatt. In the time since the power of lasers has grown constantly. In

large part research and development work has been directed at extending the wave length range, increasing the power and producing more efficient lasers. Technological research, studies of the excitation mechanism of lasers and the study of the elementary processes taking place in the discharge serve these goals. Laser research must solve new types of tasks in the area of gas discharges also. A need is arising for a further development of traditional gas discharge devices for laser purposes and for the creation of discharges in which the excitation processes can be exploited more efficiently. The present work is intended as a contribution to this area.

### Summary

One can distinguish two goals of research on hollow cathode lasers, goals essentially inseparable from one another.

One is the practical viewpoint. There might be a great need for cheap, medium power, blue, green and ultraviolet lasers; hollow cathode lasers might fill the gap here. But a number of physical problems (primarily in the physics of gas discharge, surface physics and laser physics) must still be solved to develop suitable laser designs.

We might approach the problem from the scientific side also. A study of the excitation mechanism of lasers, discovery of new laser transitions, increasing the power and efficiency of lasers and extending the wave length range of continuous lasers are all exciting scientific tasks. But to make precise, reliable measurements one must develop suitable laser designs and ensure a stable discharge and the desired gas purity.

The aim of this work was a study and further development of gas discharges used for hollow cathode lasers. The chief obstacle in developing a laser design which could be used was the insufficient stability of the discharge, the development of an arc discharge at relatively low power. A study of arcing threshold phenomena could aid an understanding of the development of an arc discharge. We were able to study laser operation in a broad current range and the experiments led to the discovery of a new continuous laser transition--one already predicted theoretically.

I consider it a significant achievement of the work that we succeeded in developing hollow cathode laser designs which made possible the performance of repeatable experiments more reliable than before and which removed the theoretical obstacles from the path of building hollow cathode lasers which can be used in practice.

The new type discharge (HAC) is still significant today primarily from the scientific viewpoint. The task here was to develop a discharge which better suited the excitation mechanism of hollow cathode lasers.

I consider it a significant achievement that we were able for the first time to create a continuous gas discharge where the energy of the electrons can be regulated independent of the gas pressure. We succeeded in showing that it is possible and worth while to further develop traditional gas discharge devices for laser purposes.

In the long run this fact will make it possible for us to adjust the parameters of the gas discharge to the unique excitation mechanism of lasers. The new laser transitions and the increase in the efficiency and output of the lasers indicate the results achieved thus far. The international reception given to the regulatable voltage discharges can be called favorable also. Summary articles and laser handbooks deal in detail with this theme. In the wake of the results published in this paper similar research is already taking place in Austria, Bulgaria, Poland, the West Berlin Technical University and two Japanese universities (Seikei, Ibaraki). At American initiative we are planning joint research with the Optical Science Center in Arizona.

The study of the problems dealt with in the work cannot be regarded as completed. A quantitative interpretation of the phenomena discovered, further perfection of the laser designs, a complex solution in a single discharge tube of the technical problems which arose--are all tasks awaiting solution. At the same time there appears to be a possibility to build simple, cheap lasers radiating blue or green light. It appears that the building of a hollow cathode laser rivaling the performance of noble gas ion lasers and the extension of the wave length range of continuous operation lasers into the ultraviolet spectrum range of vacuum are attainable.

I summarize in the following eight points the new scientific results achieved in the work:

1. I designed a new type of hollow cathode discharge tube to study the transition to arc discharge; in it a discharge cannot arise at the edges or peaks of the cathode.
2. I established that the arc discharge develops in the region of a relatively sharp "arcing threshold current" and that the current value depends on the composition and pressure of the gas. I established that there is a pressure or pressure range where the arcing threshold current is maximal. I measured the pressure dependence of the threshold current in helium, in argon and in helium-krypton and helium-neon gas mixtures.
3. On the basis of a study of discharges in hollow cathodes of various lengths I established that within broad limits the arcing threshold current is independent of the surface current density of the cathode.
4. On the basis of the results obtained in the study of arcing threshold phenomena I designed hollow cathode lasers where the arcing threshold current is several times the values found in previous discharge tubes; it became possible to classify laser designs from the arcing viewpoint, to study an He-Kr<sup>+</sup> laser in a broad pressure and current range and to discover a new continuous laser transition (Ar<sup>+</sup> 476.5 nm)--which had been predicted on a theoretical basis.
5. I developed a new type of gas discharge (HAC) where the operating voltage of the discharge tube can be freely regulated--independent of the diameter of the cathode cavity, gas pressure and current of discharge--up to several thousand volts from the 200-400 V operating voltage of the hollow cathode discharge.

6. I showed with a study of the spectrum of the HAC discharge that the ion spectrum is more intensive in the discharge--as a result of the increased electron energies--and in the case of hollow cathode lasers one can expect from the use of HAC discharge a significant increase in output and efficiency.

7. I established that in the HAC discharge the ratio among the ionized atoms of atoms ionized several times is several times the ratio which can be obtained in a traditional discharge.

8. I designed lasers using the HAC discharge. In these lasers it was possible to attain in the noble gas mixtures nearly ten times the previously attained outputs and to discover a number of new--theoretically predicted--laser transitions. In lasers operating with both cathode sputter and metal vaporization the laser operation began at current values 3-5 times smaller than the threshold current of similar, traditional lasers.

#### Expression of Thanks

The work dealt with in this paper constitutes a part of the gas laser research taking place in the Physics and Optics Main Department of the Solid Body Physics Research Institute of the MTA KFKI [Central Physics Research Institute of the Hungarian Academy of Sciences] with the support of the OMFB [National Technical Development Committee].

I would like to express my thanks to Dr Norbert Kroo and Dr Laszlo Csillag for their support and for making it possible for me to prepare the paper. Results published jointly with Dr Janos Bergou, Dr Laszlo Csillag and Dr Mihaly Janossy make up a significant part of the paper. In the course of the work we discussed together virtually every important question. I especially thank all three for their careful reading of and useful observations on the manuscript.

In regard to questions affecting an essential part of the paper I held consultations with Dr Jozsef Bakos, Dr Peter Varga and Dr Gyozo Farkas, chief colleagues at the KFKI, with Dr Kalman Antal and Ferenc Halasz, colleagues at the research laboratory of the EIVRI [United Incandescent Lamp and Electrical Company], with Dr Endre Fazekas (Budapest Technical University) and with Dr Tibor Torok (Lorand Eotvos Science University).

When building the first hollow cathode laser we used the experiences of Professor George J. Collins (Colorado State University), who then made available to us his very important experimental data obtained on cathode sputter lasers. Professor Franz Howorka (Leopold Franzens Universitat, Innsbruck) helped a great deal with his interest, advice and clear, understandable explanations; some of the measurements were done jointly at the Innsbruck University. We also did joint studies in Gdansk with Dr Jerzy K. Mizeraczyk (Institute of Fluid-Flow Machines, Gdansk). I conducted very useful consultations with Professor Shuzo Hattori (Nagoya University) and Professor Kan-Ichi Fujii (Ibaraki University) concerning discharges containing metal vapor and the interpretation and utility of high voltage hollow cathode discharges and with Professor Sergei I. Anyisimov (Landau Elm. Physics Research Institute, Moscow) concerning questions connected with the stability of hollow cathode discharges; these consultations had a very important role from the viewpoint of the final form of the paper.

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Last but not least I owe thanks to my wife who not only put up with the writing of the paper--frequently far into the night--but also created ideal conditions for writing it.

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